X

WORKING PLAN

OF THE

NAINI TÁL WORKING CIRCLE.

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INTRODUCTION.

A FEW words are necessary to explain under what circumstances this working plan was prepared.

Work in the field was begun by Mr. Dansey in April, 1880 and continued till the following June. It was resumed in April, 1881 by the undersigned, assisted by Mr. A. F. Broun, Assistant Conservator, then recently arrived from Nancy ; and by June of the same year the enumeration survey and detailed examination of compartments was completed. The same two officers visited Naini Tál again in March, 1882, and during the remainder of that field season measurements of trees and countings of concentric rings were made, in order to ascertain rate of growth and yield ; Mr. Broun, however, left Naini Tál at the end of April.

As, owing to press of work, the working plan could not be written up at once, the undersigned had to visit the forests again in 1885 and 1886 ; on the first occasion for a few days, in order to note any changes that may have occurred in the stock since June, 1882; on the second, on special duty, in order to complete the working plan. Advantage was taken of this last visit to examine the area that has been recently added to the Naini Tál Sub-division from the resumed grant that had formerly been entrusted to the late Kumaun Iron Works Company. Owing to the shortness of the time available, the chír-bearing areas alone could be explored in detail ; for the rest of the tract only a rough stock-map could be prepared, in the compilation of which free use was made of the stock-map of the Forest Survey Branch.

The working plan was completed towards the end of June last and submitted at once for approval to the Conservator. It was discussed in detail by Messrs. Greig and Bagshawe and the Divisional Officer, Mr. J. M. Braidwood, and passed in its present form.

The plan was sent to press in July ; but the first proofs came in only in instalments, and could not obviously be corrected until the proof of the entire plan was received about the middle of November.

It is necessary to state here that Part II was mostly written up by the summer of 1882 ; but laborious alterations had to be made, after undersigned was placed on special duty, in order to incorporate all the changes that had occurred in the stock during the intervening period of four years. Parts I and III, with Appendices III and IV, were written entirely at Naini Tál in June last and represent three weeks' work.

All the plantations made up to date, and the numerous roads constructed since 1879, when the Forest Survey Sheets were published, have been entered on those sheets by actual survey, and a rough sketch map of the Ninglat Forest has also been added on. An attested copy of the sheets in question showing these additional details has been deposited in the Forest Survey Office.

CAMP DEHRA DÚN :
The 29th November, 1886.

E. E. FERNANDEZ,
Offg. Deputy Director, Forest School.

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WORKING PLAN

OF THE

NAINI TAL WORKING CIRCLE.

PART I.

GENERAL ACCOUNT OF THE FORESTS.

THIS account will be given in three separate chapters, in the first of which all facts bearing on the administration of these forests will be recapitulated, in the second those influencing production, and in the third those concerning their economic condition.

CHAPTER I.—FACTS RELATING TO THEIR ADMINISTRATION.

SECTION I.—SITUATION, AREA, AND BOUNDARIES.

The tract for which the present working plan has been devised lies between 29°=18′=35″ and 29=°27′=8″ north latitude and 79°=22′=47″ and 79°=3 ′= 50″ east longitude, and is situated in the Kumaun district of the Commissionership of the same name. It extends into pattis Chakháta Pahár, Pahár Kotah, and Dhanyakot, and comprises the forests immediately surrounding the municipality and cantonment (convalescent depôt) of Naini Tál. The greatest distance, as the crow flies, of the outside boundary from the lake is 5½ miles, the average being under 4½ miles. These forests constitute one of the two sub-divisions of the Naini Tál Forest Division.

On the north and east and west the tract is conterminous with forest-covered waste lands which also form a part of the western boundary; elsewhere it adjoins the forests of the Kumaun Forest Division.

Owing to the recent addition of a portion of the resumed defunct Kumaun Iron Works Company's forests, the demarcation along a part of the south and west is still in progress and nothing can, therefore, be said here about the boundary there. Elsewhere, however, the boundaries in nearly every case follow well-defined natural features, and where they march with the limits of cultivation they consist of short straight lines of no great length, with a masonry pillar at every angle and very often small katchá intermediate pillars for further identification. These boundaries are in excellent order.

Within the tract are enclosed numerous village lands, including several small private estates, the south-eastern, south-western, and northern portion being literally honeycombed with them. The boundaries round these estates, inside the original area, are nearly all that can be desired.

Owing to the demarcation of the recently-added forests not being yet complete the exact area of the entire tract is not yet known. The area of the original tract is 19,638 acres, exclusive of the enclosed village and private lands, which aggregate 4,027 acres. The additional area, when the demarcation is complete, will probably comprise 17,530 acres without the enclosed village and other lands, which together may make up 1,041 acres.

For convenience of working and treatment the entire area of the forests has been divided into 16 blocks, as follows :—

Consecutive number.	Name of block.	Whether original or recently added area.	Acreage.	Remarks.
			Acres.	
1	Nalena	Original area ...	3,000	
2	Kuria	Ditto ...	2,337	
3	Laria Kánta	Ditto ...	1,860	
4	Bháwali	Ditto ...	4,352	
5	Budhlákot	Ditto ...	1,913	
6	Jákh	Ditto ...	2,121	
7	Chína	Ditto ...	3,863	
8	Ayárpáta	Ditto ...	192	
9	Dhabka	Recently added area ...	1,713	Area approximate.
10	Khari!	Ditto ...	1,740	Ditto.
11	Sain Dhár	Ditto ...	1,914	Ditto.
12	Adhora	Ditto ...	2,437	Ditto.
13	Khurpa Tál	Ditto ...	1,753	Ditto.
14	Mangoli	Ditto ...	3,219	Ditto.
15	Rúnsi	Ditto ...	2,071	Ditto.
16	Loichusáni	Ditto ...	2,683	Ditto.
		Total ...	37,168	Approximate.

The municipality and cantonment lands Pcomprise respectively 2,774 and 656 acres.

Section II.—History and Legal Position of the Forests.*

Previous to 1845 no control was exercised over the forest-bearing land. The settlement of Naini Tál, and practically the requirements of the village population, never very large in those times, were all that had to be provided for. Consequently, the people were allowed to help themselves without let or hindrance from the forests immediately surrounding their own villages, and no demarcation was required to preserve the waste land against the extension of cultivation, which was in every sense desirable.

Some years later the Commissioner found it necessary to protect the trees standing outside the fields in the neighbourhood of the settlement and allowed no timber to be felled without his permission. A small patrolling establishment was entertained and a royalty was levied on each tree felled to meet the expenses.

In 1857 the resources of the forests to the south and south-west of the settlement began to be used for the smelting of iron by State mining engineers. In 1858 the Khurpa Tál works were handed over to a private company, who also undertook operations below Mangoli at Káládhungi, and in 1861 another private company replaced the Government agency at Dechauri. The forest rules were relaxed in favour of both companies so as to give them the necessary control over the fuel supplies. In 1862 both companies were amalgamated under the title of the "North of India Kumaun Iron Works Company (Limited)." Of this more hereafter.

Original area.—In 1865 the forests outside the area of the iron-smelting operations were brought under departmental control under an Assistant Conservator acting under the orders of the Commissioner, who was, *ex officio*, also Conservator of Forests, and they have since then been managed solely with a view to the local wants of Naini Tál. In 1868 the Commissioner was replaced by a professional Conservator.

These forests constituted a sub-division of the Kumaun Forest Division until 1878, when by Notification No. 28F.C., dated 20th March, they were formed into an independent division under the officer in charge of the Conservator's office. But although termed a sub-division it was practically a division from 1873, as the officer in charge was directly responsible to the Conservator. In December, 1884 a re-organization took place, by which the original Naini Tál and Ránikhet Divisions were amalgamated

* For much of the information in this section free use has been made of Atkinson's "Gazetteer of the Himálayan Districts."

under the common designation of the Naini Tál Division and the forests once more became a sub-division (Government Notification No. $\frac{557 \text{ R.}}{2035}$).

Previous to 1877 the boundaries were not accurately defined, and there were practically none at all round the enclosed villages. In that year Colonel Garstin, the Assistant Commissioner, and Mr. J. M. Braidwood, the forest officer, jointly effected the present demarcation. Eighty-eight acres of included village land were acquired for Rs. 1,344 under the Land Acquisition Act, and the hollow in the centre of which the hamlet of Babilia stands was exchanged with the municipality against a portion of the northern face of the ridge on which Fairlight Hall is situated.

The want of a proper demarcation until so late as 1878 very nearly resulted in the loss of the Ayárpáta block, which was gazetted as part of the municipal forests before the mistake, through the watchful zeal of Mr. Braidwood, was detected. A few years earlier a large portion of the excellent oak forest on the northern face of the ridge running from China to Laria Kánta had been handed over to the municipality without any reference of any kind to the Forest Department.

Negotiations are at present in progress between the Department and the municipality to exchange the Ayárpáta block, which is a part of the basin of the lake, for the deep bay east of the St. Loo gorge and situated outside that basin. The exchange would be highly désirable for both parties.*

As regards the legal position of these forests, although they have always been open to the gratuitous exercise of certain rights or privileges, it has varied several times since 1865, when they were first placed under the operation of the Forest law. In 1876 a Colonel Davidson, as a private individual, drew the attention of Government to the ruined condition of these forests and advocated stricter conservancy than at the time prevailed. The result was that in 1877, in the face of much local opposition, but with the advice and unqualified support of General the Hon'ble H. Ramsay, who was fortunately then Commissioner of Kumaun, the forests were reserved under the Forest Act of 1865. In 1879, however, under the operation of the Forest Act of 1878, the existence of rights or privileges which could not be abolished prevented the area from being maintained as a reserved forest in the new sense of the term, and it was accordingly declared a protected forest by North-Western Provinces Government Notification No. 149 of 22nd February, 1879. By another Notification, No. 150 of the same date, the Ayárpáta block and the Jábar portion of the Laria Kánta block were, under section 296 of the Forest Act, declared " to be closed for 10 years and the rights of private persons (if any) over those portions suspended during the said term. "

Whether the free grazing and permission to remove without payment of royalty timber, firewood, and other forest produce are enjoyed by the villagers as a right or merely as a privilege, removeable at pleasure by the State, which has been uncontested sole proprietor from the times of the native *ráj*, and can sell or give over for cultivation, unburdened with rights of any kind, except that f way and water, any portion of these forests, is a question that cannot be profitably discussed here. Whether rights or privileges, the enjoyment of these undoubted concessions on the part of the State is regulated by the following list drawn up by the Conservator of Forests under the authority of the Commissioner :—

* Since the above was written the exchange in question has been effected, whereby the number of blocks has been reduced from 16 to 15, but the area of the Laria Kánta block increased to a corresponding extent.

List of villages which have rights in the Nain Tál Government Forests.

Name of Patti.	Names of villages having rights.	Description of rights.																				Forests or localities in which the rights may be exercised.
		Grazing.	Fodder grass.	Firewood from fallen wood.	Fodder grass for sale.	Wood for agricultural implements, with sanction of forest officer.	Grass for thatching.	Timber for building, with sanction of forest officer.	Green leaves.	Dry leaves.	Stone for building.	Slates.	Charcoal for blacksmiths, with sanction of forest officer.	Bark of creepers.	Fruits and roots.	Fishing.	Irrigation channels.	Water for mills.	Burning ghâts.	Limestone.	Bamboos and bâhar.	
Chakhâta Pahâr.	Belwákhán ...	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	...	R	Jiolikot, Jioli, Salálhar, Arukhán, Hairadhar, Basgáon dhura, Basáni, Khánlá, Sanana Khark, and Sirori forests. Burning ghát in Jála nadi.
	Jiolikot ...	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	...	R	
	Gethia ...	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	...	R	
	Charta ...	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	...	R	
	Naikána ...	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	...	R	
	Kurpákha ...	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	...	R	
	Balnikhán ...	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	...	R	
	Manora ...	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	...	R	
	Dewaldhunga ...	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	Bhumiádhár, Yakthár, Basgáon dhurá, Chopra dhura, Burápikha, Salidhar, Lakhúlidhár, and Nalena forests. Burning ghát in Nalena nadi.
	Chopra ...	R	R	R	R	R	R	R	R	R	R	...	R	R	R	R	R	R	R	R	R	
	Gajárikhet ...	R	R	R	R	R	R	R	R	R	R	...	R	R	R	R	R	R	R	R	R	
	Basgáon ...	R	R	R	R	R	R	R	R	R	R	...	R	R	R	R	R	R	R	R	R	
	Ria ...	R	R	R	R	R	R	R	R	R	R	...	R	R	R	R	R	R	R	R	R	
	Rhanpara ...	R	R	R	R	R	R	R	R	R	R	...	R	R	R	R	R	R	R	R	R	
	Matiála ...	R	R	R	R	R	R	R	R	R	R	...	R	R	R	R	R	R	R	R	R	
	Bhaliuti ...	R	R	R	R	R	R	R	R	R	...	R	R	R	R	R	R	R	R	...	R	Kosáni, Jálá, Yakthári, Jioli, and Bhaliuti forests. Burning ghát in Jála Naddi.
	Sarya Tál ...	R	R	R	R	R	R	R	R	R	...	R	R	R	R	R	R	R	R	R	R	Ghuryágaon, Khailáni, Selidhár Birouthá, Chisanekí, khark, Yakthár, Jalál ke Pathrany, Kimugair, and Matyali forests. Burning ghát in Jála nadi.
	Kuriágáon ...	R	R	R	R	R	R	R	R	R	...	R	R	R	R	R	R	R	R	...	R	Bhungár, Babláni, Bhewngarhi, Jioli Ghát. Kúmukhet, Samnaini, Lamidhár, Jukanyá, Wadyari, Kumer Pokhra, and Dhámi forests. Burning ghát in Ghatgarh ka Gadhera.
	Nagári ...	R	R	...	..	...	R	R	...	R	...	R	...	...	...	...	...	R	...	...	...	Babyar, Sunela, Gurj, Kaflári, and Syamkhet forests.
	Kahálkuira ...	R	R	...	...	...	...	...	...	.	..	.	...	..	..	..	.	R	.	...	...	Bhewngarh, Samaila, and Dugai forests.

Pauár Kotah	Talla Bagarh ...	...	...	...	...	...	...	...	...	...	...	R	...	...	...	...	...	...	...	...	...	Pali and Kaluni forests.
	Malla Bagarh ...	...	R	R	...	R	R	...	...	...	R	...	...	...	...	...	...	R	...	...	...	Musákhutki, Pali, Jogkhet, Bangjura, Mawani, Bhantli Kaunayak, Kaliápani, and Kanwáni forests.
	Bajon and Kurpákha, ...	...	...	...	...	...	...	...	...	...	...	...	...	...	R	...	...	...	...	...	...	Gairkhet, Ghingári, and Lampokhar forests.
	Ghingári ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
	Lampokhra ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
	Adhorá ...	R	R	...	...	...	R	...	...	...	...	R	...	...	R	...	..	R	...	...	...	Gyárkhet, Ranon, Lyonta, Anyarpákhá, Lampokhra, Jalpokhrá, Arukhet, Talpokhrá, Kanwáni, Siámdhar, and Limdhar forests.
	Garjolí ...	R	R	...	...	...	...	...	R	R	...	...	...	...	...	...	...	...	...	...	...	Kanona forest.
Dhanyákot	Budhlákot ...	R	R	R	R	R	...	R	R	R	R	R	R	R	R	R	R	R	R	...	R	Kawapákhá, Gwalákuri, Rikhiodyár, Garjabhirá, Selani, Bhaluagair, Kálusen, Fukhali, Dhaulidhár Pipali, Gaijan, Salain, Dúdila, Choráni Katwani Banjewra, Molani, and Asena forests.
	Pangoth ...	R	R	R	R	R	...	R	R	R	R	R	R	R	R	R	R	R	R	...	R	
	Sábjiá ...	R	R	R	R	R	...	R	R	R	R	R	R	R	R	R	R	R	R	...	R	
	Dahriá ...	R	R	R	R	R	...	R	R	R	R	R	R	R	R	R	R	R	R	...	R	Burning ghát in Ratti Ghát.
	Káphaltá ...	R	R	R	...	R	...	R	...	...	...	R	...	...	R	...	R	R	R	...	...	Below Gwar Chaur at the junction of the Rámgárh river, Jolarh, Phulikot, Wudapatti Dari, Damchor, and Pateola forests. Burning ghát in Pitrakuri in Falkhalidar.
	Bárgal ...	R	R	...	...	R	R	R	...	R	R	R	...	...	R	...	...	...	...	...	...	Damchor, Kanwaki, Tandoli, Falkhali, Woony, Wudapati, and Bangolikhán forests.
	Chorsá Nayá ...	R	R	R	R	R	R	R	R	R	...	R	R	R	R	R	R	R	R	...	R	Kalupokhra, Rayál Pátalí, Wohalipákha, Duni Chatráni, Gopalkidhar Duli, Matkina, Thelka, and Kámálta forests. Burning ghát in Chorsa-ká-Gadherá, which flows from Budhlákot.
	Ditto Puraná ...	R	R	R	R	R	R	R	R	R	...	R	R	R	R	R	R	R	R	...	R	
	Talla Ninglát ...	R	R	...	...	...	...	...	...	R	...	R	...	R	R	...	...	R	...	...	...	Náha forest.
	Malla Ninglát ...	R	R	...	...	...	R	R	...	...	...	R	...	...	...	...	...	R	...	...	...	Kononi forests.
	Kononi ...	R	R	...	...	...	R	R	...	...	...	R	...	...	...	...	...	R	...	...	...	
	Padli ...	R	R	R	R	R	R	R	R	R	...	R	R	R	R	R	R	R	R	...	R	Matyála, Chapar, Kahála, and Kámálta forests. Burning ghát above the bridge at Bhonwáli-ká-Gadhera below Ghanagaon on, the east.

List of villages which have rights in the Naini Tál Government Forests—(concluded).

Name of patti.	Name of villages having rights.	Description of rights.																				Forests or localities in which the rights may be exercised.
		Grazing.	Fodder grass.	Firewood from fallen wood.	Fodder grass for sale.	Wood for agricultural implements, with sanction of forest officer.	Grass for thatching.	Timber for building, with sanction of forest officer.	Green leaves.	Dry leaves.	Stone for building.	Slates.	Charcoal for blacksmiths, with sanction of forest officer.	Bark of creepers.	Fruits and roots.	Fishing.	Irrigation channels.	Water for mills.	Burning ghâts.	Limestone.	Bamboos and bâbar.	
DHANYÁKOT.	Sirori	R	R	R	...	...	R	...	R	R	...	R	...	R	R	...	R	R	...	...	...	Hinnan, Wunaini Pokhrá, Káhálá, and Chatráni forests.
	Jákh	R	R	R	...	R	R	R	...	...	...	R	R	...	R	...	...	R	...	...	...	Rayál, Koti, Selya, Ala, Mahra ki Kuri and Dolá forests.
	Bhaunwali ...	R	R	R	R	R	R	R	R	R	...	...	R	R	R	R	R	R	R	...	R	Hinnan, Hansewrya, Wokali, Sakniani, Suentuen, Asanguri and Chatrani forests. Burning ghát at Binayak Dánda above the village.
	Ghuná ...	R	R	R	R	R	R	R	R	R	...	R	R	R	R	R	R	R	R	...	R	Padli, Kholi, Gwarchor, Kulon-ki-dhik, Suenanidhár, Saláni, Majalaro Káhálá, and Chaitakidhár forests. Burning ghát on Khairna nadi.

N.B.—The letter R. shows that a village has a right to the forest article in the column in which it is recorded.

FOOT-NOTES FOR THE RECORD OF RIGHTS LIST.

A.—'*Firewood from fallen wood.*'—If in any case there is no fallen wood available, the Forest Department must arrange for supply.

B.—'*Timber for building.*'—The maximum size of a house, for building and maintaining which timber can be claimed, is 40′ (forty feet) × 36′ (thirty-six feet) × 16′ (sixteen feet).

C.—'*Green leaves.*'—Any trees may be lopped for green leaves except the following protected kinds, but the lopping is limited to branches not exceeding two inches in diameter :—

Sain	...	Terminalia tomentosa.	Rianj	...	Quercus lanuginosa.
Shisham	...	Dalbergia Sissoo.	Potli	...	Acer pictum and A. Cæsium.
Tun	...	Cedrela Toona.	Kákar	...	Pistacia integerrima.
Jáman	...	Eugenia Jambolana.	Brons	...	Rhododendron arboreum.
Sándhan	...	Ougeinia dalbergioides.	Utis	...	Alnus nepalensis.
Deodar	...	Cedrus Deodara.	Pamnái	...	Carpinus viminea.
Raisalla	...	Cupressus torulosa.	Saur	...	Betula acuminata.
Chir	...	Pinus longifolia.	Akhrot	...	Juglans regia.
Ango	...	Fraxinus floribunda.	Ayár	...	Pieris ovalifolia.
Kharsu	...	Quercus semecarpifolia.			

D.—With the sole exception of the right 'Fodder grass for sale,' these rights are limited to the actual domestic and agricultural requirements of the villagers for whom they are recorded, and they cannot be exercised in any way for purposes of trade.

The wording of the remarks in the last column has been altered, as they were originally quite unintelligible. Also trees that are not found in these forests have been, for obvious reasons, omitted and the orthography of well-known names has been corrected.

The additional area at present being demarcated.—The license granted to the Iron Works Company was never executed, and the Company was wound up in 1861; but the land granted to it was formally resumed only in 1885, when a portion of it, as said before, was added on to the Naini Tál forest sub-division. A forest settlement officer is at present engaged in demarcating the village lands situated within the tract and in enquiring into and setling and recording rights under Chapter II., sections 8-12, of the Forest Act. The balance of the area will be reserved, but will, nevertheless, be open to the exercise of very burdensome rights. It is a great pity that a portion of the whole area cannot be taken up as a reserve free of all rights and the remainder given up for the exclusive use of the villagers under some sort of State control in order to prevent the utter destruction of the forest on it.

Up to 1885 the forest had been under the management of the Commissioner, who collected and kept a separate account of the revenue.

SECTION III.—PROTECTION.

Administrative divisions and establishments.—The entire area is divided into two, the eastern and western, ranges by the Jákh nadi, the Naini Tál settlement, and the Nihal nadi. Each range is in charge of a forester. The number of guards, with their corresponding beats, posted to these two ranges is shown below :—

Eastern Range.	*Western Range.*
1 guard, beat Charta.	1 guard, beat Budhlákot.
1 „ „ Hinnan.	1 „ „ China.
1 „ „ Timber works.	1 „ „ Pangot.
1 „ „ Kaphlári.	1 „ „ Chhatráni.
1 „ „ Laria Kánta.	1 „ „ Adhora.
1 „ „ Runsi.	1 „ „ Saim Dhár.
	1 „ „ Mangoli.

Offences.—Statistics of offences can be given only for the original area of the sub-division. The average number of offences per annum taken before a court during the past five years has been only 22, involving 37 persons, convictions having been obtained in 19 cases against 30 individuals. Of these 22 cases two were of incendiarism, 17 of unauthorized felling and appropriation, one of illicit pasturing, and two of a miscellaneous character. The average number of petty offences compounded is not obtainable, but considering the hundreds of jhampánis and grass-cutters who roam these forests every day, it must be at least 80 per annum.

Fire-conservancy.—The progress of fire-conservancy since 1875-76, when protective measures were first attempted, is exhibited in the following statement :—

Year.	Number of acres attempted.	Number of acres burnt.	Number of fires.	Average acreage burnt in each fire.	Number of acres actually protected.	Cost. Total.			Cost. Per acre actually protected.
						Rs.	a.	p.	Pies.
1875-76	19,638	5,440	5	1,088	14,198	441	15	0	6·0
1876-77	19,638	...	...	...	19,638	222	6	6	2·2
1877-78	19,638	395	4	99	19,243	458	5	11	4·6
1878-79	19,638	2,650	11	241	16,988	506	7	8	5·7
1879-80	19,638	163	3	54	19,475	379	7	5	3·7
1880-81	19,638	47	1	47	19,591	321	2	2	3·1
1881-82	19,380	952	4	238	18,428	541	7	3	5·6
1882-83	19,380	387	11	35	18,993	612	6	9	6·2
1883-84	19,380	774	6	129	18,606	544	4	6	5·6
1884-85	19,380	80	2	40	19,300	382	11	0	3·8
1885-86	19,380	96	1	96	19,284	244	6	3	2·4
Total ...	214,628	5,544	48	43	203,744	4,415	0	5	4·2

The reduction since 1881-82 of the acreage attempted is due to the exclusion of the bare slopes at the south-western extremity of the China block, which slopes are fired every year by the Department itself in order to ensure the greater safety of the rest of the area.

Owing apparently to the damp climate of Naini Tál fires rarely occur in the chir forests here during the interval between the close of the summer and the beginning of the winter-rains, *i.e.*, in October-December, so that there is, as a rule, only a single fire-season extending from April to June.

General.—The admirable manner in which these forests have been protected is due to Mr. Braidwood's careful and prudent management during the past 13 years. The difficulties have been especially great at a place like Naini Tál, where very powerful interests unfavourable to forest conservancy have had to be overcome. Matters are now, however, on a very secure footing and effective protection is assured with a minimum of friction.

CHAPTER II.—CONDITIONS OF PRODUCTION.

This chapter will comprise a description (1) of the topography ; (2) of the climate ; (3) of the soil and sub-soil ; and (4) of the crop and its constituents.

SECTION I.—TOPOGRAPHY.

The Naini Tál forests are situated on both sides of the first ridge of the Himálayas between the Dhabka and Gola nadis. The ridge is very sharp and rugged and runs in a north-westerly direction. Enclosed between it, from China to Laria Kánta on the north, the great Deopáta spur on the west, and the Ayárpáta hill to the south, lies the lake which gives its name to the settlement and the forests. Several sinuous minor ridges run off from the main ridge, becoming ultimately parallel with it and forming with it deep narrow valleys and gorges. The outline of the ridges and spurs is extremely rugged, and the sides are broken and very steep, scarps being very common. The ridges usually rise 1,000 feet above the valleys, and not unfrequently attain a height above them of 3,000 feet.

The northern face of the main ridge is drained directly into the Kosi river, principally by the Tikri, Jákh, and Ninglát branches of the Khairna nadi. The drainage of the southern face goes partly into the Gola nadi, partly into the Nihál nadi, and partly, but very partially, into the Dhabka, the water-parting between the first and second and the second and third rivers being, respectively, the Ayárpáta ridge and its continuation down to Ránibágh and the Harial Dánda ridge.

SECTION II.—THE CLIMATE.

The distance above the tropic (7°), irrespective of the remoteness of the sea, renders the distinction of the seasons fairly well marked. The longest day, like the longest night, comprises about 16 hours.

The highest and lowest points are respectively 8,568 and 2,500 feet, but by far the largest portion of the area lies between 5,000 and 7,500 feet. Snow, therefore, falls nearly everywhere during December-March, but melts within a few hours to two or three days, except on the northern face of the main ridge, where the later falls may lie for several weeks and small deposits may sometimes be found in the cooler hollows above 7,500 feet even at the end of April.

In the subjoined tabular statement the figures in columns 2, 3, 10, and 11 have been obtained from observations taken in the settlement itself just above the level of the lake. Of the remaining figures, those in columns 4, 5, 6, and 12 are the averages for Ránikhet and those in columns 7 and 8 the averages for Mussoorie. These averages are given, as they are entirely wanting for Naini Tál itself, while of the various places in the Himálayas for which results of accurate and complete observations are available Ránikhet and Mussoorie are, perhaps, those which resemble

Naini Tál most—the former in respect of temperature and wind, the latter in respect of atmospheric moisture. The figures in columns 4, 5, and 6 are probably not high enough for Naini Tál, owing to the combined effect of greater height and immediate neighbourhood to the plains :—

Month.	Average monthly mean pressures. (Average of 5 years.)	Average mean monthly and annual shade-temperatures. (Average of 10 years.)	Average excess of insolation over corresponding maximum shade-temperatures.	Average depression of mean nocturnal temperatures below mean minimum shade-temperatures.	Mean diurnal and annual range of shade-temperature.	Average monthly mean vapour-tension.	Averge monthly mean relative humidity.	Average monthly and annual rainfall. (Average of 31·32 years.)	Mean resultant wind directions. (Average of 7 years).	Monthly mean velocity of wind in miles per diem. (Average of 7 years.)
January ...	23·865	42·8	61·1	14·5	16·1	202	66	2·78	S49°E.	71·9
February ...	23·834	45·3	60·6	13·6	17·0	206	64	3·08	S39°E.	77·0
March ...	23·858	55·5	62·6	13·9	18·2	249	53	2·48	S.	87·1
April ...	23·832	60·4	60·4	13·3	18·6	280	45	1·73	S57°E.	131·3
May ...	23·760	66·0	60·3	12·0	18·1	322	49	2·80	S49°E.	98·0
June ...	23·687	69·1	57·1	9·0	15·0	471	62	15·37	S40°E.	120·0
July ...	23·693	68·4	50·8	5·3	11·2	643	99	24·62	S41°E.	129·1
August ...	23·716	67·3	52·1	6·0	10·9	620	99	23·61	S44°E.	150·3
September ...	23·758	65·4	59·8	8·9	13·1	621	98	11·19	S44°E.	136·4
October ...	23·879	59·3	57·3	13·5	15·3	402	70	1·70	S41°E.	116·6
November ...	23·905	52·7	52·7	17·2	17·2	281	71	0·19	S38°E.	99·5
December ...	23·894	46·6	55·7	19·1	16·1	240	72	1·37	S41°E.	95·0
Year ...	23·807	58·2	57·5	12·2	15·5	378	70	90·82	...	109·4

The winter rains generally begin about the third week in December and last till the end of February or beginning of March. April and the first half of May are stormy; a few heavy showers of rain always occur, generally accompanied with sharp falls of hail. In May-June, before the setting in of the summer rains, the hills are frequently shrouded in thick mists.

In January and February the temperature out in the open often sinks down to 19° during the night and seldom rises above 70° in the sun. During the same season the day-temperature in the shade is generally under 50°. The highest temperature in the sun occurs in August-September, when the exposed thermometer may register as much as 160°.

Section III.—Soil and Sub-soil.

The sub-soil or immediately underlying rock is extremely varied. Geologically speaking, we are here amidst upper tertiaries and the slate series of the lower Himálayas, comprising the infra-Blaini, Blaini, infra-Krol and Krol groups, with intrusive trap and bands and patches of greenstone and quartzite.

The line of separation between the tertiary and Himaláyan rocks runs westwards below (south of) Tircha Khet to Saria Tál, thence across the Bhalia, past Bhaliuti to Chopra and Jiolkot, and then sweeps round to the north-west past Naikhána. Here it bends round to the south and then again to the north, forming a loop round Balni and Aru Kháns and going as far as Rúnsi, whence it trends westwards, skirting the ridge south of Khurpa Tál, and from there it finally takes a north-westerly direction. These tertiaries consist principally of loose and coarse conglomeratic and soft sandstones and constitute a very dry subsoil, on which no oaks are found, but which favours and is the sole cause of the remarkable upward extension of sál up to 5,000 feet.

Of the Himálayan rocks, the infra-Blaini and Blaini rocks just put in an appearance at the north-western corner of the forests, while the infra-Krol and Krol groups compose the main mass of the hills north of the tertiaries.

The infra-Krol group forms everywhere the base and lower mass of the hills. The shales are seldom carbonaceous, are nearly always very much contorted and crushed, and not unfrequently undergo crystalline foliation and become more schistose than slaty.

The most extensively distributed of the Himálayan formations is the Krol group. The well-known compact or crypto-crystalline limestone, here of a dark, almost black colour, crowns the main ridge, the minor Chhatráni ridge and the larger one comprising the Deopáta and Ayárpáta hills and the southern extension of the latter as far as Balni Khán. Massive outcrops of it occur on the easterly slopes coming down from the last-mentioned ridge, and at Belwa Khán the Nalena flows over the rock. The crests of the spurs running down south-west from the China ridge are also formed of this rock. With the limestone occur subordinate shaly beds of a grey or pale pink colour, and at the base there is a variable band of coarsish silicious sandstone which sometimes becomes quartzitic.

In the infra-Krol shales there are intrusions of trap, which are well seen on the northern face of the main ridge near China.

Along the entire length of the basins of the Ninglát stream, on both sides of the valley, greenstone crops out, and associated with it is a pure hard white quartzite. There is also a small outcrop of the same greenstone at the north-western extremity on the hill overlooking the Dhabka.

The soil is obviously more variable than the underlying rock, for besides being different according to the rock or rocks from which it is formed, the gradient, the configuration of the ground, the aspect, and the nature of the tree-covering obviously exercise each its own modifying effect on its composition, depth, texture, colour, moisture and power of absorbing moisture and gases. Speaking in a general manner, however, it may be said (i) that, where quite bare of forest, it is apt to be completely washed away or to deteriorate to a very great extent for forest purposes, especially for reproduction ; (ii) that under pine forest it is generally dry and unfertile ; (iii) that under broad-leaved forest it is always full of rich vegetable mould and moist close to the surface during the driest time of the year, although on account of the steepness of the slope it may be of no depth ; and (iv) that in the neighbourhood of the Krol limestone, unless owing to long exposure and steep gradients it has been washed away, it is always extremely fertile and capable of maintaining as close-packed a mass of trees and shrubs as can possibly stand together.

Springs are not numerous during the dry season, owing to the loose nature of the sub-soil nearly everywhere except where the limestone crops out, and it is, therefore, an indispensable condition for the fertility of the soil that the forest growth on it should be as complete as possible in order to secure the necessary protection for the moisture in it.

Section IV.—The Stock.

The subject of this section will be treated under four heads as under :—

I.—Types of forest growth.

II.—Special account of principal constituent species.

III.—Quantity of standing stock.

IV.—Plantations.

Article I.—Types of forest growth.

There are four principal types, as follow, beginning from the bottom :—

I., *Sál forest.*—This type is found in patches and small bands in the tertiary area, occupying the crests and higher slopes of ridges and spurs up to 5,000 feet; but it is only up to 4,000 feet that it is met with on all aspects. Above 4,000 feet it occurs only in small patches and bands, and exclusively on southerly slopes. Sál is obviously the predominant tree, and with it a more or less large proportion of sain and, at the higher levels, also of *Engelhardtia Colebrookiana* is associated.

Scattered chír are also found where the forest is not dense, and indeed, near the upper limit of the type, chir has a tendency to monopolise the crest of the ridges. The growth is generally dense, covering the ground well; but the trees, although they attain a moderately large girth, are stunted and deformed owing to the constant lopping they have always suffered.

Reproduction is abundant, where there is room for it, and is easily obtainable. Fires are not a regular annual occurrence even without special protective measures, except at elevations below 3,000 feet. The more important instances of this type are the large path covering the hill above Kasáni on the road from Ránibágh to Naini Tál, and the three parallel belts crowning the ridges and spurs on each side of the Nihál nadi and Loichusáni Gad.

II., *Forest of inferior species.*—This is a very variable type, as the species composing it change with aspect, gradient, elevation, and configuration of the ground; but, although of extensive distribution, it is too unimportant to be sub-divided. Like the sál type it comes in at the lowest point, but it goes up several hundred feet higher. It consists principally of *Bauhinias*, *Ougeinia dalbergioides*, *Machilus*, *Phœbe*, *Tetranthera*, *Cocculus laurifolia*, *Oleaglandulifera*, jamun *Calliearpa Albizzia*, *Leucomeris spectabilis*, *Phyllanthus nepalensis*, *Pittosporum*, simal, *Grewia*, hollies, maples, *Viburnums* *Rhus*, *Pistacia*, *Coriaria nepalensis*, *Dalbergia hircina*, *Pyrus Pashia*, *Erythrina Cotoneaster*, *Terminalia Chebula*, *Cornus*, *Alnus nepalensis*, *Bœhmeria rugulosa*, &c., with shrubs, such as barberrias, brambles, *Saruja*, *Murraya*, *Prinsepia*, &c. The growth is generally open, except in the vicinity of streams and in the deeper ravines and glens at the higher elevations, where laurels, olive, *Quercus annulata*, *Symplocos*, &c., compose the stock, and fires are naturally excluded. The worst class of the type is *Bauhinia* and *Ougeinia* scrub on steep, dry hillsides, which, without special protection, burn regularly every year between March and June. As regards the distribution of this type, it forms the greater portion of the Kuria block and the proposed reserve, is very largely represented at the lower elevations in the Nalena block, and covers the steep faces overhanging the Jákh nadi opposite Ghuna.

III., *Chír Forest.*—This type is met with between 3,500 and 7,000 feet, although it flourishes best between 3,800 and 6,500 feet. It is found on all aspects and only requires the soil to be silicious and the sub-soil to be well drained. It hence occupies most of the drier and well-lit slopes above 3,500 feet, and especially the ridges and crests of spurs. The best and largest portions of chír forest are—(i) that occupying the upper slopes of the Nalena basin and extending over the watershed into the proposed reserve—approximate area 1,300 acres; (ii) that stretching with hardly any interruption, save bands of oak running up the ravines and large patch of scrub belonging to type II, from Tirchákhet right away to the extremity of the forest and occupying nearly the entire area of the Bhawáli and Budhlákot blocks, more than half of the Jákh block and small portions of the Kuria and Laria Kánta blocks—approximate area 5,000 acres; (iii) that occupying for the most part the northern face of the Saimdhar—approximate area 700 acres; (iv) that lying west of Mangoli—approximate area 300 acres; (v) that on the slopes at the head of the Nihál nadi and just below the Ayárpáta scarp—approximate area 350 acres. Adding on the smaller patches not mentioned above, the aggregate area occupied by chír forest is about 8,000 acres; but most of it is situated on such steep ground that one out of every three trees will always be unfit for the sawyer. The chír is mostly pure, but broad-leaved trees are fortunately, under the present careful conservancy, putting in an appearance and coming on well where they existed before. The chír will always, however, remain the predominant tree, and the broad-leaved individuals will never, as a rule, do more than serve as stopgaps or form an open understory protecting and fertilizing the soil. On all moderate slopes reproduction, although a slow process, is generally easy to obtain in sufficient quantity: but the exclusion of fires is a *sine quâ non* and special fellings are generally indispensable. On the easy slopes in the Nalena block and elsewhere and on the low ridges in the

Budhlákot block reproduction is nearly all that can be desired. Without special measures, chír forest, owing to the thick accumulation of resinous leaves, may burn at any time between February and the end of June, and occasionally during the period between the end of the summer and beginning of the winter rains. But the fires, where they do occur, do not rise more than a few feet, and almost the only danger to be apprehended from them is for the reproduction.

IV., Oak forest—This type, ascending to the highest point attained in the forest, begins at an elevation of 3,700 feet, but does not become a persistent type below 4,000 feet, in cool, moist, protected ravines and below 5,000 feet elsewhere. The oaks composing it are essentially the two gregarious species, banj and kharsu. Of the two that are not strictly gregarious, *viz.*, phanyath and tilonj, the former is generally found in company with laurels in moist localities in type II, while the latter, like riánj, the distribution of which is limited, accompanies bánj and kharsu. The bánj sub-type beginning at the lowest limit reaches 7,300 feet, at which point the kharsu sub-type comes in. The principal species associated with the oaks are brons (by far the most numerous), maples, *Cornus*, hornbeams, birch, alder, ash, spindle trees, &c., with abundant ayar, chiefly on exposed slopes up to 7, 600 feet, and viburnums, *Deutzia symplocos*, honeysuckles, &c., and such undershrubs as *Indigofera Desmodium*, *Spiræa*, *Leycesteria Daphne*, &c., forming a dense undergrowth. However poor the soil might be originally, the close growth which this type, whenever it has had a chance, forms, protects the moisture of the former and enriches it with a heavy accumulation of well-decomposed vegetable mould. Reproduction, owing to the profuse seeding of the oaks and the great variety of other component species, presents no difficuty. Fires are almost naturally excluded without the help of special measures, and even when they do occur, they are very mild and do little damage. Up to 6,500 feet oak forest fills most of the broader ravines and glens and covers the moister slopes, especially those with a northerly aspect. Above that elevation the type is general on every aspect and crowns nearly all the ridges and spurs. Oak forest at Naini Tál, at least in the original protected area, shows no signs of lopping except in the immediate neighbourhood of villages—a remakable fact due to the very effective management of Mr. Braidwood.

Article II.—The principal constituent species.

The timber tree of Naini Tal is, *par excellence*, the chír. The principal fuel trees are at present the oaks and brons. Sál and sain are only future timber trees, but they can both yield a very large proportion of excellent fuel, while ayar is so largely distributed that special notice of it cannot be omitted. The prospects of ash are very hopeful, and some account of that tree must also be given. The remaining trees are too slightly represented, or are of too little comparative present importance either as fuel or timber, to require being specially described.

CHÍR (*Pinus longifolia*).

This tree is found at every elevation in these forests up to 7,400 feet, but it is gregarious and even abundant only between 3,500 and 7,000 feet. On moist slopes and cool protected aspects it is a gregarious tree only up to 6,500 feet. It affects silicious soil, and, indeed, is confined mainly to the slopes and ridges where the underlying rock is sandstone or quartzite or the shales become schistose. Thus is explained its absence from the Chína and Deopáta ridges and from the greater portion of the Laria Kánta block. This characteristic and its need of a well-drained sub-soil also explains why the tree is gregarious only in a few places on the tertiary formations in the proposed reserve. The chír in Naini Tal is practically a deciduous tree, for the new foliage of the year only just begins to come out when all the leaves have fallen, and for a few days the trees are quite leafless. This phenomenon is no doubt due to the hot sun of May and the extreme dryness of the soil at that time of the year.

Although no year passes without many of the trees seeding, nevertheless gregarious seeding occurs only once in two or three years, and it is only then that the cones are

produced in large numbers by individual trees and contain a large proportion of fertile seed.

The steepness of the slopes is unfavourable to reproduction, but it has been proved beyond question that the loosening and wounding of the soil due to felling and export operations always results in a large proportion of the seeds being arrested on the hillside and germinating and sending down their roots sufficiently deep to survive the following season of drought. In the absence of such operations advance growth is extremely rare, except on ridges and on the gentler slopes. It is, therefore, permissible to conclude that with special wounding of the soil just before a good fall of seed there ought to be no difficulty in obtaining a sufficiently abundant reproduction. The reproduction of chír is best on tertiary formations, as, for instance, in the upper portions of the Nalena block; this is due to the much more favourable sub-soil there than the generally hard sandstones, often quartzitic, which compose the underlying rock in the Himálayan portion, and which prevent the roots of the seedlings from getting down deep enough before the season of drought comes on.

Under the difficult conditions under which chír reproduction takes place in these forests, it is not to be wondered at that where forest fires are not kept out chír seedlings are phenomenally rare.

An obvious point, but one that is generally overlooked in connection with chír reproduction, is that seedlings may be produced and survive for at least two or three years under an almost complete cover even of broad-leaved species. It would hence be a very great error to open out an already too spare leaf-canopy with the expectation that the appearance of new seedlings would thereby be facilitated. Far from helping reproduction, such a procedure would only retard it and militate against its ultimate satisfactory accomplishment.

The immediately following statement gives the results of the counting of concentric rings in chír at Naini Tál. In order to minimise the error due to the habit chír has of producing numerous spurious rings the counting was effected thus:—Two diameters crossing each other at right angles, and being respectively the maximum and minimum diameters of any stump in question, were aligned on the section, and the number of rings on each of the four radii was ascertained by careful counting with the aid of a magnifying glass. The smallest number thus obtained was adopted and the respective numbers counted on the remaining three radii were rejected. No doubt, even with this precaution, several spurious rings were included; but there was no method of eliminating all possible error except by tracing each ring all round the circumference to test its completeness, and the enormous labour such a procedure would have entailed would have been entirely prohibitive. Nevertheless the residuum of error is, after all, only very slight and cannot vitiate in any appreciable degree any general conclusions drawn from the figures actually obtained.

Results of countings of concentric rings of wood in chir.

Running number of tree.	Number of rings counted on																Thickness of bark.
	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	11th	12th	13th	14th	15th	16th	
	Inch of radius.																
1	5	5	5	7	9	15	24	...	...	...	...	...	...	...	...	...	0·5
2	6	7	8	6	7	7	10	14	16	...	...	...	...	...	...	...	0·5
3	17	31	35	34	24	19	17	22	17	18	14	30	27	...	...	...	0·4
4	14	16	26	31	22	24	24	22	21	19	16	24	18	30	26	...	0·6
5	4	6	6	8	13	15	28	37	...	...	...	...	...	...	...	...	0·6
6	5	5	6	7	7	10	11	19	22	...	...	...	...	...	...	...	0·5
7	6	6	10	10	15	18	16	21	19	...	...	...	...	...	...	...	0·6
8	5	8	12	10	14	15	20	24	...	...	...	...	...	...	...	...	0·5
9	6	7	9	13	17	16	14	23	18	...	...	...	...	...	...	...	0·5
10	3	4	7	11	18	14	18	13	16	...	...	...	...	...	...	...	0·5
11	6	8	10	6	6	10	12	19	26	...	...	...	...	...	...	...	0·5
12	5	5	5	8	10	13	23	40	...	...	...	...	...	...	...	...	0·8
13	7	8	9	13	14	17	20	27	...	...	...	...	...	...	...	...	0·5
14	4	4	5	8	10	10	9	13	12	12	17	...	...	...	...	...	0·6
15	3	5	9	8	7	17	27	30	...	...	...	...	...	...	...	...	0·6
16	8	9	13	18	19	32	27	...	...	...	...	...	...	...	...	...	0·7
17	6	7	6	8	9	11	16	25	24	...	...	...	...	...	...	...	0·7
18	6	7	8	11	14	15	11	15	16	13	...	...	...	...	...	...	0·3
19	4	4	5	10	11	13	24	23	40	32	35	34	...	...	...	...	0·5
20	17	20	17	23	25	22	27	30	28	31	30	...	...	...	...	...	0·5
21	5	6	8	22	27	23	18	24	33	25	34	29	29	23	...	...	0·6
22	5	6	6	5	7	8	9	11	13	15	25	...	...	...	...	...	0·4
23	7	11	14	14	8	8	9	7	8	7	9	11	12	22	...	...	...
24	6	5	4	6	7	6	9	9	11	18	19	17	...	...	...	...	0·5
25	7	7	8	8	10	13	15	29	39	...	...	...	...	...	...	...	0·5
26	8	8	9	9	9	14	15	21	27	...	...	...	...	...	...	...	0·5
27	5	7	7	9	8	10	10	16	14	...	...	...	...	...	...	...	0·7
28	6	5	4	6	7	11	11	15	30	40	...	...	...	...	...	...	0·6
29	4	5	5	6	5	8	8	10	12	14	24	37	...	...	...	...	0·8
30	4	4	7	20	50	46	49	31	13	14	23	15	15	17	...	...	0·4
31	6	9	7	8	8	11	12	11	11	10	...	...	...	...	...	...	0·7
32	5	8	7	6	7	11	13	11	8	10	12	20	28	...	...	...	0·5
33	5	6	7	10	15	23	31	31	...	...	...	...	...	...	...	...	0·5
34	5	5	5	6	9	11	11	12	12	25	16	...	...	...	...	...	0·8
35	7	5	5	6	8	11	11	21	29	40	...	...	...	...	...	...	0·5
36	5	7	9	9	13	17	14	20	19	23	37	...	...	...	...	...	0·8
37	5	6	6	9	13	18	14	23	21	...	...	...	...	...	...	...	0·5
38	6	6	6	8	8	13	17	20	27	35	...	...	...	...	...	...	0·7
39	5	6	7	8	10	11	11	10	9	12	12	17	15	...	...	...	0·5
40	6	6	9	12	13	13	16	13	20	14	...	...	...	...	...	...	0·4
41	5	7	11	7	12	11	12	12	14	16	16	15	...	...	...	...	0·4
42	13	13	13	13	13	12	14	11	10	11	9	12	20	...	...	...	0·4
43	6	5	7	7	7	5	9	10	17	16	22	23	...	...	...	...	0·6
44	4	5	7	14	8	10	17	30	42	...	...	...	...	...	...	...	0·5
45	14	16	10	9	10	8	13	17	22	21	...	...	...	...	...	...	0·6
46	7	8	7	11	8	11	13	11	15	33	...	...	...	...	...	...	0·6
47	13	12	8	7	8	12	12	14	29	30	...	...	...	...	...	...	0·4
48	5	10	23	23	19	23	16	19	20	16	17	16	24	29	36	...	0·5
49	19	18	21	21	22	19	30	18	20	25	...	...	...	...	...	...	0·4
50	3	6	8	11	9	7	10	16	34	30	...	...	...	...	...	...	0·5
51	3	7	6	6	7	7	7	8	11	17	22	27	30	...	...	...	0·4
52	5	4	5	7	10	12	8	11	14	24	35	...	...	...	...	...	0·6
53	4	5	6	6	7	7	...	...	...	...	...	...	...	...	...	...	0·4
Total	350	416	483	579	653	753	842	939	879	666	444	327	218	121	59	...	28·1
Averages.	7	8	9	11	12	14	17	19	20	21	21	22	22	24	30	...	0·54

From numerous observations it has been ascertained that in these forests chir seedlings take on an average 11 years to attain a height of 4′ 6″, at which height standing trees are usually measured. For about six years they make very little growth above ground, while their roots are establishing themselves in the unfavorable soil and especially sub-soil already several times noticed. It is only when the roots are thus established that they are able to absorb sufficient nourishment from the soil to enable the aërial portion above to push on rapidly upwards. It is, therefore, necessary in computing the age of a chir stem by means of the number of concentric rings to increase that number by 11. This has been done in the following estimate of ages for different girths. The thickness of the bark has been assumed to

be from 0·3 to 0·6 inches, according to the size of the tree in question. It is true that in trees that have reached maturity the bark diminishes in thickness owing to the diminished thickness of the living liber and green parenchyma; but, on the other hand, the last rings of wood produced are of almost inappreciable thickness, so that the one circumstance compensates for any error resulting from the other :—

Age of chír at various girths measured at breast height.

Girth	6	inches,	radius	1·0	inch,	age	18	years.
„	12	„	„	1·9	inches	„	25	„
„	18	„	„	2·9	„	„	33	„
„	24	„	„	3·8	„	„	41	„
„	30	„	„	4·8	„	„	53	„
„	36	„	„	5·7	„	„	64	„
„	42	„	„	6·7	„	„	77	„
„	48	„	„	7·6	„	„	93	„
„	54	„	„	8·6	„	„	112	„
„	60	„	„	9·6	„	„	130	„
„	66	„	„	10·5	„	„	149	„
„	72	„	„	11·5	„	„	169	„
„	78	„	„	12·4	„	„	190	„
„	84	„	„	13·4	„	„	211	„
„	90	„	„	14·3	„	„	233	„
„	96	„	„	15·3	„	„	261	„

It will be observed that chír in Naini Tál increases fairly rapidly in girth up to the age of 90 years, when it is just under 4 feet in girth. The mean annual diametral increment then falls off gradually up to 6 feet, after which it rapidly diminishes.

In order to ascertain the average contents of chír of the two highest girth classes, which almost exclusively furnish timber for sawing, 16 trees of the first class and 20 of the second were felled, divided into logs of 10 feet length, and measured. The length of timber-yielding bole after breakage due to felling was also noted. The detailed computation of contents and reducing factors will be found in Appendices I and II. What follows here is a summary of the results of that computation :—

Computation of contents of, and reducing factor for, chír trees.

CLASS I.

Serial number of type tree.	Dimensions.			Actual contents in cubic feet of			Contents in cubic feet of entire tree by square of ¼ girth at breast height.	Reducing factor for		
	Girth at breast height.	Height in feet.	Length of timber-yielding bole, in feet.	Timber.	Firewood.	Entire tree.		Timber.	Firewood.	Entire tree.
1	9′ 5″	105	100	352	84	436	581	0·606	0·144	0·750
2	7′ 1″	109	70	175	29	204	342	0·512	0·085	0·597
3	6′10″	105	80	192	53	245	306	0·627	0·173	0·800
4	6′10″	98	70	186	52	238	286	0·650	0·182	0·832
5	6′ 8″	97	80	179	25	204	269	0·665	0·093	0·758
6	6′ 8′	98	60	112	34	146	271	0·413	0·125	0·638
7	6′ 8″	84	60	104	28	132	233	0·446	0·120	0·569
8	6′ 4″	104	80	179	31	210	261	0·686	0·119	0·805
9	6′ 4″	102	70	143	23	166	256	0·559	0·090	0·649
10	6′ 4″	100	70	112	23	135	250	0·448	0·092	0·540
11	6′ 3′	104	60	138	79	217	254	0·543	0·311	0·854
12	6′ 1″	86	60	126	43	169	199	0·633	0·216	0·849
13	6′ 1″	99	70	128	32	160	225	0·569	0·142	0·711
14	6′ 1″	83	60	126	29	155	192	0·656	0·151	0·807
15	6′ 0″	94	70	136	22	158	211	0·645	0·104	0·749
16	6′ 0″	88	70	135	22	157	198	0·682	0·111	0·793
Total ...	105′ 8″	1,556	1,130	2,523	609	3,132	4,334	9·340	2·258	11·598
Averages ...	6′ 7″	98	71	158	38	196	265	0· 58	0· 14	0· 74

Computation of contents of, and reducing factor for, chir trees—(concluded).

CLASS II.

Serial number of type tree.	Dimensions.			Actual contents in cubic feet of—			Contents in cubic feet of entire tree by square of ¼ girth height.	Reducing factor for—		
	Girth at breast-height.	Height in feet.	Length of timber-yielding bole in feet.	Timber.	Firewood.	Entire tree.		Timber.	Firewood.	Entire tree.
1	5′11″	109	70	139	37	176	238	0·584	0·156	0·740
2	5′10″	92	60	110	45	155	196	0·561	0·229	0·790
3	5′10″	98	70	120	29	149	210	0·571	0·138	0·709
4	5′10″	87	60	110	39	149	185	0·595	0·210	0·805
5	5′ 9″	97	70	124	24	148	200	0·620	0·120	0·740
6	5′ 9″	104	70	121	26	147	215	0·563	0·121	0·684
7	5′ 8″	91	70	108	20	128	183	0·590	0·109	0·699
8	5′ 8″	75	50	85	25	110	151	0·563	0·166	0·729
9	5 7′	86	60	104	43	147	168	0·619	0·256	0·875
10	5′ 7″	92	50	93	46	139	179	0·519	0·257	0·776
11	5′ 5″	84	60	95	19	114	154	0·617	0·123	0·740
12	5′ 4″	91	50	82	21	103	162	0·506	0·130	0·636
13	5′ 4″	78	50	68	22	90	135	0·504	0·163	0·667
14	5′ 2″	84	60	85	18	103	140	0·607	0·129	0·736
15	5′ 1″	104	60	93	20	113	168	0·554	0·119	0·673
16	5′ 0″	98	60	85	14	99	153	0·556	0·091	0·647
17	4′ 0″	74	50	77	22	99	108	0·713	0·204	0·917
18	4′ 9″	104	50	72	32	104	147	0·490	0·210	0·700
19	4′ 8″	79	50	60	15	75	108	0·556	0·139	0·695
20	4′ 7″	98	50	64	20	84	129	0·496	0·155	0·651
Total ...	107′ 7″	1,825	1,170	1,895	537	2,432	3,329	11·384	3·225	14·609
Averages ...	5′ 5″	91	58	95	27	122	167	0·57	0·16	0·73

In the next tabular statement the results of measurements and weighments of stunted and knotty second, third, and fourth class chir trees, suitable only for fuel, are recorded. The wood was weighed with bark on, just before delivery to the Commissariat, *i e.*, about one month after felling :—

Serial number of tree.	Girth at breast height.	Diameter class.	Weight in maunds of 100 lb.	Contents in cubic feet.		Weight in pounds of one cubic foot.		Factor for reducing		
				Solid.	Stacked.	Solid.	Stacked.	Stacked contents in cubic feet to weight in maunds	Weight in maunds to stacked contents in cubic feet.	Stacked to solid contents.
1 ...	5′ 8″	II.	48	100	136	...	...	...	...	...
2 ...	5′ 7″	"	37	73	99	...	...	...	...	...
3 ...	5′ 4″	"	45	98	126	...	...	...	...	...
4 ...	5′ 4″	"	30	64	80	...	...	...	...	...
5 ...	5′ 3″	"	21	46	55	...	...	...	...	...
6 ...	5′ 2″	"	34	72	94	...	...	...	...	...
7 ...	5′ 0″	"	33	68	92	...	...	...	...	...
8 ...	5′ 0″	"	20	43	55	...	...	...	...	...
9 ...	4′ 8″	"	20	42	53	...	...	...	...	...
10 ...	4′ 7″	"	20	44	58	...	...	...	...	...
Total ...	51′ 7″	II.	309	649	848	...	...	...	...	...
Averages ...	5′ 2″	II.	31	65	85	48	37	0·37	2·70	0·77
1 ...	4′ 4″	III.	26	56	77	...	...	...	...	...
2 ...	4′ 4″	"	22	46	58	...	...	...	...	...
3 ...	4′ 3″	"	17	37	47	...	...	...	...	...
4 ...	4′ 0″	"	26	54	73	...	...	...	...	...
5 ...	4′ 0″	"	12	26	37	...	...	...	...	...
6 ...	4′ 0″	"	10	21	29	...	...	...	...	...
7 ...	3′10″	"	15	34	46	...	...	...	...	...
8 ...	3′ 9″	"	24	51	75	...	...	...	...	...
9 ...	3′ 8″	"	13	28	37	...	...	...	...	...
10 ...	3′ 8″	"	12	25	37	...	...	...	...	...
11 ...	3′ 7″	"	9	20	30	...	...	...	...	...
12 ...	3′ 6″	"	17	38	48	...	...	...	...	...
13 ...	3′ 6″	"	13	27	38	...	...	...	...	...
14 ...	3′ 5″	"	19	41	56	...	...	...	...	...
15 ...	3′ 4″	"	12	26	35	...	...	...	...	...
16 ...	3′ 4″	"	11	25	33	...	...	...	...	...
Total ...	60′ 6″	III.	258	555	756	...	...	...	...	...
Averages ...	3′ 9″	III.	16	35	50	46	32	0·32	3·11	0·70
1 ...	3′ 3″	IV.	10	23	32	...	...	...	...	...
2 ...	3′ 0″	"	8	18	27	...	...	...	...	...
3 ...	2′10″	"	7	17	26	...	...	...	...	...
4 ...	2′ 8″	"	6	15	23	...	...	...	...	...
5 ...	2′ 7″	"	4	11	17	...	...	...	...	...
6 ...	2′ 5″	"	3	8	11	...	...	...	...	...
Total ...	16′ 9″	IV.	38	92	136	...	...	...	...	...
Averages ...	2′ 9″	IV.	6	15	23	41	28	0·28	3·57	0·68

The diminishing weight of the solid cubic foot as the size of the tree diminishes is fully explained by the fact that, as the firewood billets are not barked, the dryage is greater in direct ratio to the small size of the billets and the larger proportion of bark

From the three preceding statements we can determine the yield per tree of the various classes which we may adopt in order to compute the yield of the forest. The timber trees experimented with were felled on fairly good ground, and it is, therefore, necessary to make an allowance for more extensive breakages than what actually occurred in the case of those trees. On the other hand, the trees felled for fuel were stunted and misshapen and were, therefore, rather smaller than the average. Bearing these circumstances in mind, we may fix the following yield per tree :—

	Class I.		Class II.		Class III.		Class IV.	
	Cubic feet of timber.	100lb maunds of firewood.	Cubic feet of timber.	100lb maunds of firewood.	Cubic feet of timber.	100lb maunds of firewood.	Cubic feet of timber.	100lb maunds of firewood.
Trees fit for sawing ...	100	40	60	25	20	12	...	...
Trees fit only for fuel ...	...	85	...	52	...*	21	...	7

The following figures are interesting and are made use of in Part III to determine the age at which chír becomes exploitable:—

Girth of tree at breast height.	Average age of tree in years.	Average height of tree in feet.	Average length of timber-yielding bole in feet.	*Average contents in cubic feet of.*			*Mean annual increment in cubic feet of.*		Remarks.
				Timber.	Firewood.	Entire tree.	Timber.	Entire tree.	
5′0″	130	89	54	78	20	98	0·60	0·75	*Those figures are rather exaggerated owing to an abnormally bulky tree, without which average figures for a 7-foot tree could not have been obtained.
5′6″	149	91	60	100	28	128	0·67	0·86	
6′0″	169	95	67	128	33	161	0·76	0·96	
6′6″	190	98	68	146	37	183	0·77	0·96	
7′0″	211	100	74*	180*	40	220*	0·85*	1·04*	

Chír trees at Naini Tál cease lengthening their boles when they are about 5 feet in girth, but they go on increasing in height, owing to the continued development of the topmost branches, until they are 200 years old, the average maximum height attained being 100 feet.

The Oaks.

The Naini Tál forests contain the following oaks :—

Phanyath (*Q. annulata*)—Locally in the warmer moist ravines up to 5,000 feet, exceptionally up to 5,600 feet.

Bánj (*Q. incana*)—From 4,000 to 7,200 feet.
Tilonj (*Q. dilatata*)—From 6,300 to 8,200 feet.
Riánj (*Q. lanuginosa*)—On cool aspects from 6,400 to 7,400 feet.
Kharsu (*Q. semecarpifolia*)—From 6,800 to the highest point of the forests.

Phanyáth.—This oak occurs, either sporadically or in small groups, generally in the midst of a dense growth of laurels and other moisture-loving trees. On account of its very slight distribution it possesses little importance.

Bánj.—This is the most widely-distributed and important of the oaks. It is gregarious over continuous areas and forms excellent dense forests capable of easy regeneration. Its rate of diametral growth is exhibited in the subjoined statement. On account of a sufficient number of complete radii not being obtainable showing the concentric rings of wood clearly, it has not been possible to put the results in the same form as those for chír. It may, however, be said that the rate of diametral increase is remarkably uniform up to the girth of about 5 feet, after which it becomes

very slow. The thickness of the bark varies from ⅓ to ½ inch, the average being about 0·4 inch :—

Counting of concentric rings of wood in bánj.

Serial number of round.	Counting along: A complete average radius. Lenght of radius.	Counting along: A complete average radius. Number of rings.	Counting along: A partial radius. Length of radius.	Counting along: A partial radius. Number of rings.	Average number of rings per inch. Along complete radii.	Average number of rings per inch. Along partial radii.	Average number of rings per inch. Average of two preceding columns.
	Inches.		Inches.				
1	7·00	51	...	...	7	...	...
2	3·00	16	...	...	5	...	...
3	6·00	37	...	...	6	...	...
4	6·00	75	...	...	12	...	...
5	4·75	54	...	...	11	...	...
6	4·75	89	...	...	19	...	...
7	1·87	17	...	...	9	...	...
8	7·50	78	...	...	10	...	...
9	4·75	52	...	...	11	...	...
10	6·31	72	...	...	11	...	...
11	6·30	96	...	...	15	...	...
12	7·75	76	...	...	10	...	...
13	...	...	1·25	11	...	9	...
14	...	...	2·50	30	...	12	...
15	...	...	1·10	14	...	13	...
16	...	...	6·00	30	...	5	...
17	...	...	5·75	40	...	7	...
18	...	...	3·62	20	...	6	...
19	...	...	9·00	63	...	7	...
20	...	...	9·25	142	...	15	...
21	...	...	8·50	50	...	6	...
22	...	...	5·25	40	...	8	...
23	...	...	4·50	31	...	7	...
24	...	...	5·25	60	...	11	...
25	...	...	4·30	45	...	11	...
26	...	...	5·00	50	...	10	...
Total,	65·98	713	71·27	626	11	9	10

Banj is the third largest of the oaks here, being just ahead of kharsu. It occasionally reaches a height of 80 feet, but its average stature is only of 50-60 feet. The average contents of trees of the various girth-classes is lumped up in a single statement with that of the other oaks. It was not possible to record it separately for each species, as the time at the disposal of the working plans officers in the field would not have permitted the measurement and weighment of a sufficiently large number of trees of each kind.

Tilonj.—Tilonj is easily the largest of the oaks both in height and girth. It affects cool slopes and ravines with rich moist calcareous soil. In favourable situations it can run up to 110 feet with a girth of 18-22 feet. Although gregarious, it is generally found associated with a more or less large proportion of other species, such as kharsu, riánj, maples, rhododendron, hornbeam, &c. The rate of both upward and lateral growth is appreciably more rapid than that of the other oaks, but no opportunity of counting annual concentric rings of wood presented itself. Tilonj reproduces itself naturally in great abundance and forms dense thickets of saplings and poles.

Riánj.—This oak, more than the tilonj, confines itsel to cool, protected aspects, and, like that species, requires a large proportion of calcareous elements in the soil. It is found only in two localities, the high slopes of the Laria Kánta block and the cool moist slopes and valleys of the Chína and Jákh blocks just behind the lofty sheltering Chína ridge. Even in these places it covers no continuous areas, but appears in patches in the midst of tilonj and kharsu forest. In size and rapidity of growth it is intermediate between tilonj and bánj, approaching more nearly the former. No countings of concentric rings of wood was made. The natural reproduction of riánj is good, without, however, being as abundant as that of tilonj, bánj, and kharsu.

Kharsu.—This oak is confined to the higher elevations, irrespective of aspect. Indeed, it is peculiarly a light-loving tree and prefers southerly and westerly aspects, provided the elevation is great enough. Hence it covers nearly the entire upper face of

the great China and Deopáta ridges and forms a less dense forest than its congeners. It is the smallest of the four oaks specially described here. Its reproduction, owing to the acorn ripening during the summer rains, is all that can be desired.

The results of ring-countings in kharsu are shown in the following statement :—

Counting of concentic rings of wood in kharsu.

Serial number of round.	Counting along a				Average number of rings per inch.		
	Complete radius.		*Partial radius.*				
	Length of radius.	Number of rings.	Length of radius.	Number of rings.	On complete radii.	On partial radii.	Average of two preceding columns.
1	6·90	110	...	...	...	...	...
2	3·00	26	...	...	...	...	...
3	6·25	102	...	...	...	...	...
4	5·81	81	...	...	...	...	...
5	7·87	90	...	...	...	...	...
6	8·75	47	...	...	...	...	...
7	7·50	125	...	...	...	...	...
8	6·95	77	...	...	...	...	...
9	7·09	94	...	...	...	...	...
10	8·57	63	...	...	...	...	...
11	3·12	40	...	...	...	...	...
12	5·40	38	...	...	...	...	...
13	6·80	101	...	...	...	...	...
14	6·85	98	...	...	...	...	...
15	7·10	70	...	...	...	...	...
16	4·00	30	...	...	...	...	...
17	...	...	7·80	46	...	...	...
18	...	...	0·60	14	...	...	...
19	...	...	2·00	26	...	...	...
20	...	...	5·00	64	...	...	...
21	...	...	12·00	67	...	...	...
22	...	...	6·75	78	...	...	...
23	...	...	5·00	39	...	...	...
24	...	...	6·87	67	...	...	...
25	...	...	2·25	26	...	...	...
26	...	...	4·80	45	...	...	...
27	...	...	3·37	49	...	...	...
28	...	...	5·50	41	...	...	...
29	...	...	5·70	40	...	...	...
30	...	...	14·00	51	...	...	...
31	...	...	9·50	37	...	...	...
32	...	...	8·00	70	...	...	...
33	...	...	12·00	50	...	...	...
34	...	...	10·20	60	...	...	...
Total ...	101·96	1,192	121·34	870	11·7	7·2	9·2

General.—Although the various species offer special peculiarities, nevertheless, with the present insufficient data available, it will be best to consider them all together as regards rate of diametral growth and yield.

Allowing 12 years for seedlings to establish themselves and attain a height of about 4 feet 6 inches, at which point they make a sudden rapid start upwards, and bearing in mind that the rate of diametral growth is fairly uniform up to a girth of about 5 feet, we may put down the following average figures for the ages of the oaks at different girths :—

Girth	6	inches,	radius	1·0	inch,	age	19	years.
"	12	"	"	1·9	inches	"	28	"
"	18	"	"	2·9	"	"	38	"
"	24	"	"	3·8	"	"	47	"
"	30	"	"	4·8	"	"	57	"
"	36	"	"	5·7	"	"	66	"
"	42	"	"	6·7	"	"	76	"
"	48	"	"	7·6	"	"	86	"
"	54	"	"	8·6	"	"	97	"
"	60	"	"	9·6	"	"	110	"
"	66	"	"	10·5	"	"	125	"
"	72	"	"	11·5	"	"	145	"

The average contents of trees of the various girth-classes are given in the statement below. In measuring the trees experimented with they were cut up into billets of 18 inches length, and each billet was separately cubed and its contents worked out separately. Nothing below 3 inches in girth was measured :—

Serial number of trees.	Species of oak.	Girth at breast height.	Girth-class.	Weight in maunds of 100lb.	Contents in cubic feet.		Weight in pounds of one cubic foot.		Factor for reducing		
					Solid.	Stacked.	Solid.	Stacked.	Stacked contents in cubic feet to weight in maunds of 100lb.	Weight in maunds of 100lb. to stacked contents in cubic feet.	Stacked to solid contents.
1	Banj	13′ 1″	I.*a*.	129	221	307	...	...	...	...	...
2	Kharsu	13′ 5″	„	108	174	278	...	...	..	...	...
3	Do.	12′ 7″	„	139	219	305	...	...	...	...	...
4	Do.	11′ 0″	„	114	210	307	...	...	...	...	...
5	Tilonj	12′ 0″	„	170	282	419	...	...	...	...	...
	Total ...	62′ 1″	I.*a*.	660	1,106	1,616	...	...	...	...	...
	Averages ...	12′ 5″	I.*a*.	132	221	223	60	41	0·41	2·44	0·68
1	Kharsu	10′ 0″	I.*b*.	141	232	358	...	...	...	...	...
2	Do.	10′ 0″	„	73	119	189	...	...	...	...	...
3	Do.	9′ 10″	„	183	299	451	...	...	...	...	...
4	Do.	9′ 6″	„	74	125	195	...	...	...	...	...
5	Do.	9′ 6″	„	64	109	185	...	...	...	...	...
	Total ...	48′ 10″	I.*b*.	635	884	1,378	...	...	...	...	...
	Averages ...	9′ 9″	I.*b*.	107	177	276	61	39	0·39	2·56	0·64
1	Banj	8′ 4″	I.*c*.	80	128	196	...	...	...	...	...
2	Do.	8′ 4″	„	80	129	189	...	...	...	...	...
3	Do.	8′ 0″	„	104	176	276	...	...	...	...	...
4	Do.	7′ 10″	„	63	113	186	...	...	...	...	...
5	Do.	7′ 8″	„	127	203	366	...	...	...	...	...
6	Kharsu	8′ 10″	„	104	179	238	...	...	...	...	...
7	Do.	8′ 7″	„	77	128	198	...	...	...	...	...
8	Do.	7′ 11″	„	62	111	169	...	...	...	...	...
9	Do.	7′ 9″	„	84	151	219	...	...	...	...	...
10	Do.	7′ 8″	„	35	58	88	...	...	...	...	...
	Total ...	80′ 11″	I.*c*.	816	1,376	2,125	...	...	...	...	...
	Averages ...	8′ 1″	I.*c*.	82	139	212	59	38	0·38	2·63	0·15
1	Banj	6′ 1″	I.*d*.	73	121	187	...	...	...	...	...
2	Kharsu	7′ 5″	„	65	114	183	...	...	...	...	...
3	Do.	7′ 3″	„	36	61	94	...	...	...	...	...
4	Do.	7′ 0″	„	83	92	133	...	...	...	...	...
5	Do.	6′ 6″	„	24	43	77	...	...	...	...	...
6	Do.	6′ 5″	„	42	66	91	...	...	...	...	...
7	Do.	6′ 4″	„	54	94	153	...	...	...	...	...
8	Do.	6′ 0″	„	50	85	121	...	...	...	...	...
	Total ...	53′ 0″	I.*d*.	400	676	1,039	...	...	...	...	...
	Averages ...	6′ 7″	I.*d*.	50	84	130	59	39	0·39	0·26	0·65
1	Banj	5′ 10″	II.	37	65	101	...	...	...	...	...
2	Kharsu	5′ 10″	„	43	71	105	...	...	...	...	...
3	Do.	5′ 7″	„	34	60	103	...	...	...	...	...
4	Do.	5′ 7″	„	40	65	104	...	...	...	...	...
5	Do.	5′ 6″	„	28	50	83	...	...	...	...	...
6	Do.	4′ 8″	„	18	29	44	...	...	...	...	...
7	Riánj	5′ 9″	„	75	130	191	...	...	...	...	...
	Total ...	38′ 9″	II	275	470	731	...	...	...	...	...
	Averages ...	5′ 6″	II	39	67	104	58	38	0·38	2·63	0·64

Serial number of trees.	Species of oak.	Girth at breast height.	Girth-class.	Weight in maunds of 100 lbs.	Contents in cubic feet. Solid.	Contents in cubic feet. Stacked.	Weight in pounds of one cubic foot. Solid.	Weight in pounds of one cubic foot. Stacked.	Factor for reducing: Stacked contents in cubic feet to weight in maunds of 100 lb.	Factor for reducing: Weight in maunds of 100 lb. to stacked contents in cubic feet.	Factor for reducing: Stacked to solid contents.
1	Kharsu	4′ 3″	III.	17	29	51	...	...	...	...	...
2	Do.	3′ 11″	„	8	14	23	...	...	...	...	...
3	Do.	3′ 10″	„	19	33	46	...	...	...	...	...
4	Do.	3′ 8″	„	9	16	29	...	...	...	...	...
5	Do.	3′ 6″	„	8	15	29	...	...	...	...	...
6	Do.	3′ 5″	„	10	17	24	...	...	...	...	...
7	Do.	3′ 4″	„	12	19	28	...	...	...	...	...
8	Do.	3′ 0″	„	4	7	13	...	...	...	...	...
9	Tilonj	3′ 11″	„	19	33	49	...	...	...	...	...
10	Do.	3′ 3″	„	11	19	35	...	...	...	...	...
11	Do.	3′ 3″	„	14	23	38	...	...	...	...	...
12	Do.	3′ 2″	„	14	24	38	...	...	...	...	...
13	Do.	3′ 2″	„	17	29	48	...	...	...	...	...
14	Riánj	4′ 4″	„	45	78	122	...	...	...	...	...
	Total ...	50′ 0″	III.	207	356	573	...	...	...	...	...
	Averages ...	3′ 7″	III.	15	25	41	58	36	0·36	0·28	0·62
1	Kharsu	2′ 10″	IV.	6	10	17	...	...	...	...	...
2	Do.	2′ 10″	„	6	11	18	...	...	...	...	...
3	Do.	2′ 9″	„	6	11	16	...	...	...	...	...
4	Do.	2′ 8″	„	4	7	13	...	...	...	...	...
5	Do.	2′ 6″	„	4	8	13	...	...	...	...	...
6	Do.	2′ 6″	„	4	7	12	...	...	...	...	...
7	Do.	2′ 4″	„	2	4	8	...	...	...	...	...
8	Do.	2′ 1″	„	2	5	8	...	...	...	...	...
9	Do.	1′ 8″	„	2	3	5	...	...	...	...	...
10	Tilonj	2′ 10″	„	6	10	17	...	...	...	...	...
11	Do.	2′ 7″	„	4	7	13	...	...	...	...	...
12	Do.	2′ 5″	„	5	9	15	...	...	...	...	...
	Total ...	30′ 0	IV.	51	92	155	...	...	...	...	...
	Averages ...	2′ 6″	IV.	4	8	13	55	33	0·33	3·03	0·59

In all subsequent calculations the yield per tree has been assumed as under :—

Class I.	...	90 maunds of	100	lb.
„ II.	...	40 „	100	„
„ III.	...	15 „	100	„
„ IV.	...	4 „	100	„

With respect to the weight of the solid cubic foot of oak obtained by the preceding calculations, it must be observed that many of the trees experimented with were hollow or contained decomposed portions, and that all the measurements were taken over the bark, which after a week's drying is obviously very much lighter than wood. Hence the lowness of the figures obtained. The weight of barked sound wood from three to four weeks after felling would range from 65 to 67 or even 68 pounds. To have experimented with only perfectly sound trees deprived of bark would evidently have been a mistake, for in the actual exploitation of the forest we must sell sound as well as unsound and hollow trees.

Brons *(Rhododendron arboreum)* and Ayar *(Pieris ovalifolia)*

These two species are considered together, as neither the one nor the other, specially ayár, is much sought after, and their comparative importance is due mainly to their great abundance.

Brons comes in a little above the lower limit of banj, and is a regular and largely represented companion of tilonj, riánj, and kharsu up to 8,000 feet. Its small seed finds lodgment on the steepest ground, and once the young seedling is established, it is extremely tenacious. The tree coppices vigorously and seeds abundantly every year, and, being also spare-crowned, it is an excellent auxiliary species for the oaks.

Without reaching any great height (average 35·50 feet), it attains a very considerable girth, often exceeding 13 feet. It grows fairly rapidly in diameter up to a great age, but produces a very irregular-shaped, often fluted trunk. From the subjoined table it will be seen that brons increases in thickness at the same rate as bánj and kharsu:

Counting of concentric rings of wood in brons.

Serial number of round.	Counting along a				Average number of rings per inch.			Serial number of round.	Counting along a				Average number of rings per inch.		
	Complete radius.		Partial radius.						Complete radius.		Partial radius.				
	Length of radius in inches.	Number of rings.	Length of radius in inches.	Number of rings.	On complete radii.	On partial radii.	Average of two preceding columns.		Length of radius in inches.	Number of rings.	Length of radius in inches.	Number of rings.	On complete radii.	On partial radii.	Average of preceding columns.
1	1·00	4	...	...	4	...	...	30	...	...	1·30	15	...	11	...
2	2·50	31	...	...	12	...	...	31	...	...	5·75	44	...	7	...
3	2·37	31	...	...	13	...	...	32	...	...	3·20	35	...	10	...
4	7·00	112	...	...	16	...	...	33	...	...	4·60	69	...	15	...
5	6·50	53	...	...	8	...	...	34	...	...	15·00	82	...	5	...
6	1·75	12	...	...	7	...	...	35	...	...	12·70	79	...	6	...
7	1·00	11	...	...	11	...	...	36	...	...	3·25	36	...	11	...
8	3·85	27	...	...	7	...	...	37	...	...	8·20	98	...	12	...
9	3·62	18	...	...	5	...	...	38	...	...	5·20	43	...	8	...
10	2·00	26	...	...	13	...	...	39	...	...	2·80	20	...	7	...
11	8·00	121	...	...	15	...	...	40	...	...	3·30	39	...	12	...
12	4·75	64	...	...	13	...	...	41	...	...	4·75	39	...	8	...
13	3·60	51	...	...	14	...	...	42	...	...	2·50	11	...	4	...
14	3·87	67	...	...	17	...	...	43	...	...	8·70	35	...	4	...
15	5·12	66	...	...	12	...	...	44	...	...	3·00	50	...	17	...
16	4·75	62	...	...	13	...	...	45	...	...	3·50	43	...	12	...
17	4·00	42	...	...	10	...	...	46	...	...	2·40	36	...	15	...
18	6·37	59	...	...	9	...	...	47	...	...	2·75	37	...	13	...
19	4·50	35	...	...	8	...	...	48	...	...	10·50	66	...	6	...
20	7·75	93	...	...	12	...	...	49	...	...	8·37	80	...	9	...
21	7·50	60	...	...	8	...	...	50	...	...	4·37	50	...	11	...
22	4·75	42	...	...	8	...	...	51	...	...	9·12	90	...	10	...
23	5·25	60	...	...	11	...	...	52	...	...	7·08	60	...	9	...
24	6·50	100	...	...	15	...	...	53	...	...	8·00	90	...	11	...
25	3·37	45	...	...	13	...	...	54	...	...	2·00	12	...	6	...
26	9·81	59	...	...	6	...	...	55	...	...	8·25	80	...	9	...
27	6·78	92	...	...	13	...	...	56	...	...	8·25	17	...	7	...
28	...	...	6·00	34	...	6	...	57	...	...	4·25	37	...	8	...
29	...	...	6·40	54	...	8	...	58	...	...	5·00	53	...	11	...
	—								128·26	1,453	174·41	1,534	11·3	8·8	10

Ayár puts in an appearance about the same level as a brons, but does not extend as high up. It generally affects open ground which is at the same time sufficiently moist. Like brons, its small seeds germinate easily on the steepest and most rugged slopes, and, when once in possession of the ground, it is very tenacious and coppices freely. It is a much smaller tree than brons, and even when it attains a large girth, most of its wood is in the trunk, the yield of the branches being comparatively insignificant. It is also a very slow grower. There is hence no advantage, so far as the quantity of production is concerned, in preserving the tree after it has attained a girth of 4 feet 6 inches. The main benefit to be derived from ayár is from its presence on bare grassy slopes, which, thanks to its abundant small light seeds, it soon covers with some sort of forest growth and prepares the way for more valuable species.

As a sufficient number of ayár could not be measured, and as it is a species of which only small individuals are to be maintained in the forest, it has been included with brons in the subjoined statement of the yield of trees according to the girth-classes. There was no time to measure up accurately all the trees felled, so that for many only weight and stacked contents are given.

Serial number of trees.	Species.	Girth at breast height.	Diameter class.	Weight in maunds of 100 lb.	Contents in cubic feet. Solid.	Contents in cubic feet. Stacked.	Weight in pounds of one cubic foot. Solid.	Weight in pounds of one cubic foot. Stacked.	Factor for reducing: Stacked contents in cubic feet to weight in maunds.	Factor for reducing: Weight in maunds to stacked contents in cubic feet.	Factor for reducing: Stacked to solid contents.
1	Brons ...	13′ 4″	I.*a*.	84	...	280	...	...	...	...	...
2	Do. ...	11′ 6″	„	82	...	248	...	...	...	...	...
3	Do. ...	11′ 0″	„	60	...	182	...	...	...	...	...
	Total ...	35′ 10″	I.*a*.	226	...	710	...	...	...	...	...
	Averages ...	11′ 11″	I.*a*.	75	?	237	?	32	0·32	3·12	?
1	Brons ...	10′ 4″	I.*b*.	46	...	147	...	...	...	...	...
2	Do. ...	9′ 7″	„	38	...	107	...	...	...	...	...
3	Do. ...	9′ 6″	„	24	...	66	...	...	...	...	...
4	Do. ...	9′ 4″	„	54	...	195	...	...	...	...	...
5	Do. ...	9′ 3″	„	58	...	156	...	...	...	...	...
6	Do. ...	9′ 3″	„	52	...	145	...	...	...	...	...
7	Do. ...	9′ 0″	„	34	...	91	...	...	...	...	...
8	Do. ...	9′ 0″	„	31	...	99	...	...	...	...	...
	Total ...	75′ 3″	I.*b*.	337	...	1,006	...	...	...	...	...
	Averages ...	9′ 5″	I.*b*.	42	?	126	?	33	0·33	3·03	?
1	Brons ...	8′ 10″	I.*c*.	38	76	127	...	...	...	...	...
2	Do. ...	8′ 7″	„	45	91	123	...	...	...	...	...
3	Do. ...	8′ 4″	„	22	45	73	...	...	...	...	...
4	Do. ...	8′ 2″	„	48	93	125	...	...	...	...	...
5	Do. ...	8′ 0″	„	30	59	80	...	...	...	...	...
6	Do. ...	7′ 9″	„	37	74	124	...	...	...	...	...
7	Do. ...	7′ 9″	„	26	51	74	...	...	...	...	...
8	Do. ...	7′ 7″	„	24	49	74	...	...	...	...	...
9	Do. ...	7′ 7″	„	22	43	76	...	...	...	...	...
	Total ...	72′ 7″	I.*c*.	292	581	876	...	...	...	...	...
	Averages ...	8′ 1″	I.*c*.	32	65	97	50	33	0·33	3·03	0·66
1	Brons ...	7′ 1″	I.*d*.	18	38	60	...	...	...	...	...
2	Do. ...	7′ 1″	„	21	44	65	...	...	...	...	...
3	Do. ...	7′ 0″	„	30	61	86	...	...	...	...	...
4	Do. ...	6′ 3″	„	30	60	92	...	...	...	...	...
5	Do. ...	6′ 2″	„	26	53	86	...	...	...	...	...
6	Do. ...	6′ 2″	„	18	40	66	...	...	...	...	...
7	Do. ...	6′ 0″	„	25	49	75	...	...	...	...	...
8	Ayár ...	6′ 0″	„	13	29	46	...	...	...	...	...
	Total ...	51′ 9″	I.*d*.	181	374	576	...	...	...	...	...
	Averages ...	6′ 6″	I.*d*.	23	47	72	48	31	0·31	3·23	0·65
1	Brons ...	5′ 11″	II.	19	...	63	...	...	...	...	...
2	Do. ...	5′ 10″	„	24	53	80	...	...	...	...	...
3	Do. ...	5′ 7″	„	24	...	70	...	...	...	...	...
4	Do. ...	5′ 7″	„	18	...	53	...	...	...	...	...
5	Do. ...	5′ 6″	„	7	...	24	...	...	...	...	...
6	Do. ...	5′ 4″	„	19	42	65	...	...	...	...	...
7	Do. ...	5′ 3″	„	17	39	59	...	...	...	...	...
8	Do. ...	5′ 2″	„	20	...	64	...	...	...	...	...
9	Do. ...	5′ 0″	„	10	...	32	...	...	...	...	...
10	Do. ...	4′ 11″	„	25	51	79	...	...	...	...	...
11	Do. ...	4′ 10″	„	21	47	75	...	...	...	...	...
12	Do. ...	4′ 10″	„	16	...	24	...	...	...	...	...
13	Do. ...	4′ 9″	„	18	...	66	...	...	...	...	...
14	Do. ..	4′ 8″	„	7	...	24	...	...	...	...	...
15	Ayár ...	5′ 7″	„	8	...	23	...	...	...	...	...
16	Do. ...	5′ 6″	„	10	21	29	...	...	...	...	...
	Total ...	84′ 3″	II.	257	253	830	...	...	...	...	...
	Averages ...	5′ 3″	II.	16		48	46	31	0·31	3·23	0·65

Serial number of trees.	Species.	Girth at breast height.	Diameter class.	Weight in maunds of 100 lb.	Contents in cubic feet. Solid.	Contents in cubic feet. Stacked.	Weight in pounds of one cubic foot. Solid.	Weight in pounds of one cubic foot. Stacked.	Factor for reducing: Stacked contents in cubic feet to weight in maunds.	Factor for reducing: Weight in maunds to stacked contents in cubic feet.	Factor for reducing: Stacked to solid contents.
1	Brons ...	4′ 2″	III.	15	33	53	...	...	...	...	...
2	Do. ...	4′ 0″	„	6	...	21	...	...	...	...	...
3	Do. ...	4′ 0″	„	10	...	29	...	...	...	...	...
4	Do. ...	3′10″	„	7	...	22	...	...	...	...	...
5	Do. ...	3′ 9″	„	8	18	26	...	...	...	...	...
6	Do. ...	3′ 6″	„	5	...	17	...	...	...	...	...
7	Do. ...	3′ 4″	„	3	7	11	...	...	...	...	...
8	Do. ...	3′ 3″	„	3	...	9	...	...	...	...	...
9	Ayár ...	4′ 0″	„	5	...	18	...	...	...	...	...
10	Do. ...	4′ 0″	„	8	...	30	...	...	...	...	...
11	Do. ...	4′ 0″	„	5	11	16	...	...	...	...	...
12	Do. ...	3′ 3″	„	5	...	14	...	...	...	...	...
	Total ...	45′ 1″	III.	80	69	266	...	...	...	...	...
	Averages ...	3′ 9″	III.	7	17	22	45	30	0·30	3·30	0·65
1	Brons ...	2′10″	IV.	3	7	12	...	...	...	...	...
2	Do. ...	2′ 8″	„	2½	...	9	...	...	...	...	...
3	Do. ...	2′ 5″	„	2	5	8	...	...	...	...	...
4	Do. ...	2′ 3″	„	2	...	7	...	...	...	...	...
5	Do. ...	1′11″	„	1½	3	6	...	...	...	...	...
6	Do. ...	1′ 9″	„	1¼	...	5	...	...	...	...	...
7	Do. ...	1′ 6″	„	0¾	...	3	...	...	...	...	...
8	Ayár ...	2′ 8″	„	1½	3	5	...	...	...	...	...
9	Do. ...	2′ 3″	„	1¼	...	4	...	...	...	...	...
10	Do. ...	1′ 8″	„	0¾	...	2	...	..	...	...	...
	Total ...	21′11″	IV.	16	18	61	...	...	...	...	...
	Averages ...	2′ 0″	IV.	1·6	13½	6	44	26	0·26	3.85	0·58

In subsequent calculations the following figures have been assumed for the contents of brons and ayár trees :—

Girth class I. ... 35 maunds.
„ II. ... 18 „
„ III. ... 6 „
„ IV. ... 9½ „

SÁL *(Shorea robusta)*

Sál reaches in these forests the highest altitude it has been known to attain, *viz.*, 5,000 feet; but, what is a remarkable fact, it seldom, if ever, extends beyond the limits of the tertiary formation, so that it disappears at low altitudes wherever the metamorphic or Himálayan rocks come in. It does not exceed 70 feet in height, and there are no really sound trees six feet and upwards in girth. But the species has not received fair treatment, being heavily lopped from its earliest years for manuring turmeric fields. With sufficient protection and the heavy lopping confined to the more unpromising trees that must ultimately come out in improvement fellings it will certainly attain larger timber dimensions. Sál reproduction, although not so abundant and vigorous as at the foot of the hills, is nevertheless fairly good here, and the maintenance of the tree as the predominant element of the crop where it is growing will never present any difficulty. The numerous knotty, stunted, sickly saplings and poles will require to be cut back flush with the ground to grow up vigorously again.

The sál area in the original protected forest being small, it was not considered worth while to fell and measure up trees of the various girth-classes. But with the large additional area comprised in the proposed reserve, there is now no alternative but to form an eye-estimate of the yield, thus :—

	Class I.		Class II.		Class III.		Class IV.	
	Cubic feet of timber.	100lb maunds of firewood.	Cubic feet of timber.	100lb maunds of firewood.	Cubic feet of timber.	100lb maunds of firewood.	Cubic feet of timber.	100lb maunds of firewood.
Trees fit for timber ...	50	50	30	20	10	8	2	4
Trees fit only for fuel ...	...	80	...	38	...	15	...	6

SAIN *(Terminalia tomentosa).*

The sain is a regular companion of sál everywhere, more especially on southerly and easterly slopes. It is fairly well represented, without being so abundant or so easily reproduced as sál, than which it, however, attains slightly larger dimensions. The following is an eye-estimate of the yield of sain trees of the different girth-classes :—

	Class I.		Class II.		Class III.		Class IV.	
	Cubic feet of timber.	100lb maunds of firewood.	Cubic feet of timber.	100lb maunds of firewood.	Cubic feet of timber.	100lb maunds of firewood.	Cubic feet of timber.	100lb maunds of firewood.
Trees fit for timber ...	50	55	30	20	8	10	...	...
Trees only fit for fuel ...	...	85	...	38	15	...	...	6

ASH *(Fraxinus floribunda).*

This very valuable tree is confined to rich moist soils, generally in the neighbourhood of limestone rocks. It ranges between 6,400 and 8,000 feet of altitude. It attains an average height of forty feet and girth of five feet; but until recently it was neglected, and there is no reason why under proper treatment it should not reach much larger dimensions. It seeds most profusely, and, although germination requires the entire space of twelve months, it reproduces itself fairly well on loose soil that is free of weeds. It is also capable of very easy artificial propagation, and seedlings three years old attain an average height of from three to five feet.

CYPRESS *(Cupressus torulosa).*

There is very little cypress at present in the stock, and the only situation fit for that species and where there was originally a small forest of it, *viz.*, the south-westerly slopes of the China ridge just below the Pangot bridle-road, is now, owing to the destruction of the forest growth on it, a dry shaly hillside, which it will be extremely difficult to rewood again with any species.

Article 3.—Quantity of standing stock.

The Protected Area.

An enumeration survey of the stock in the original protected forest has given the results which are tabulated below. The following species were surveyed :—

Chír, cypress, sál, sain, phanyát, bánj, tilonj, riánj, kharsu, brons, and ayár; and of these species only stems at least eighteen inches in girth were counted in four girth-classes as follows :—

Class I.	... Girth above 6 feet.			
„ II.	...	„	4½ „	and up to 6 feet.
„ III.	...	„	3 „	„ 4½ „
„ IV.	...	„	1½ „	„ 3 „

Considering that almost every stick within seven miles of the settlement is utilized, it is to be regretted that the remaining species were not also included in the survey, even under a single class, as miscellaneous species ; and that a smaller girth-class from nine to eighteen inches was not also formed. Everything under nine inches in girth would then have been more advance growth, and really forming an integral part of the *future*, not the *standing*, stock.

Areas in which the ground was very precipitous or threatened with slipping, or the stock too open or in too degraded a condition to be fit, at least for the present, for regular steady working, were excluded from the survey. These areas are indicated

on the block map by means of burnt-sienna shading and are also shown in the following statement :—

Areas excluded from enumeration survey.

Block.	Running number of compartment.	Acreage.	Total acreage.	Acreage of block.	Percentage excluded from block.
Nalena	1	132	495	3,000	16
Do.	23	115			
Do.	24	248			
Kuria	4	354	1,352	2,337	58
Do.	5	198			
Do.	6	191			
Do.	11	246			
Do.	12	70			
Do.	13	293			
Laria Kánta	1	125	125	1,860	7
Bhawáli	8	115	115	4,352	3
Budhlákot	3	70	402	1,913	21
Do.	4	332			
Jákh	3	325	802	2,121	38
Do.	8	487			
Do.	12	90			
Chína	12	393	459	3,863	12
Do.	16	66			
Total for entire protected forest ...	...	...	3,750	19,638	19

With the qualifications specified in the preceding paragraph of this article, the standing stock comprises the following trees :—

Summary of enumeration survey for entire forest.

Species.	Diameter class.	Nalena block, 3,000 acres.	Kuria block, 2,337 acres.	Laria Kánta block, 1,860 acres.	Bhawáli block, 4,352 acres.	Budhlákot block, 1,913 acres.	Jákh block, 2,121 acres.	Chína block, 3,863 acres.	Ayárpata block, 192 acres.	Entire forests.
Chir ...	I.	489	53	208	1,813	1,199	881	344	...	4,987
	II.	1,596	156	715	8,512	4,399	1,128	481	...	16,987
	III.	5,753	204	1,849	26,378	12,030	1,615	533	...	48,362
	IV.	16,355	215	7,142	68,462	17,009	6,119	642	...	115,944
		24,193	628	9,914	105,165	34,637	9,743	2,000	...	186,280
Sál ...	I.	99	34	...	...	...	...	...	...	133
	II.	516	81	...	...	...	...	...	...	597
	III.	2,698	247	...	...	...	...	...	...	2,945
	IV.	11,137	685	...	...	...	...	...	...	11,822
		14,450	1,047	...	...	...	...	...	...	15,497
Sain ...	I.	120	8	...	1	3	...	...	...	132
	II.	315	34	...	1	4	...	...	...	354
	III.	1,189	214	...	7	39	...	...	...	1,449
	IV.	3,559	391	...	15	133	...	...	...	4,098
		5,183	647	...	24	179	...	...	...	6,033
Cypress ...	I.	...	...	...	...	...	...	17	1	18
	II.	...	...	...	...	...	...	22	1	23
	III.	...	...	...	...	...	...	134	3	137
	IV.	...	...	...	...	...	...	711	2	713
		...	...	...	...	...	...	884	7	891

Summary of enumeration survey for entire forest—(concluded).

Species.	Diameter class.	Nalena block, 3,000 acres.	Kuria block, 2,337 acres.	Laria Kánta block, 1860 acres.	Bhawáli block, 4,352 acres.	Budhlákot block, 1,913 acres.	Jákh block, 2,121 acres.	Chína block, 3,863 acres.	Ayárpáta block, 192 acres.	Entire forest.
Phanyát ...	I.	76	...	...	22	13	...	...	...	111
	II.	199	...	...	33	44	...	...	...	276
	III.	669	...	...	171	201	...	1	...	1,042
	IV.	1,295	...	...	680	652	4	...	1	2,632
		2,239	...	...	906	910	4	1	1	4,061
Bánj ...	I.	383	47	3,274	3,237	2,242	2,181	5,570	396	17,336
	II.	917	127	4,113	6,090	3,174	2,087	5,663	352	22,523
	III.	2,681	351	7,502	18,871	6,016	3,356	10,035	728	49,540
	IV.	7,298	1,106	14,424	61,974	12,851	6,982	30,357	2,486	137,478
		11,279	1,631	29,313	90,172	24,283	14,606	51,625	3,962	226,871
Tilon ...	I.	...	...	1,234	5	23	348	1,815	335	3,760
	II.	...	...	1,180	...	11	342	1,983	313	3,829
	III.	...	...	2,084	15	25	511	3,839	549	7,023
	IV.	...	...	3,996	14	83	1,082	12,314	4,003	21,492
		...	...	8,494	34	142	2,283	19,951	5,200	36,104
Riánj ...	I.	...	...	364	...	...	307	148	...	819
	II.	...	...	554	...	...	378	108	...	1,040
	III.	...	...	1,434	...	...	370	237	...	2,041
	IV.	...	...	3,468	...	...	439	1,329	...	5,236
		...	...	5,820	...	...	1,494	1,822	...	9,136
Kharsu ...	I.	...	...	3	...	...	258	1,034	...	1,295
	II.	...	...	7	...	...	314	1,764	2	2,087
	III.	...	...	5	...	...	460	5,500	1	5,966
	IV.	...	...	31	...	...	569	11,492	5	12,097
		...	...	46	...	...	1,601	19,790	8	21,445
Ayár ...	I.	30	...	144	35	21	381	225	3	839
	II.	150	...	467	224	140	616	618	11	2,226
	III.	976	...	2,195	1,699	746	1,889	3,130	27	10,662
	IV.	3,757	3	7,928	9,884	5,376	5,226	13,737	166	46,077
		4,913	3	10,734	11,842	6,283	8,112	17,710	207	59,804
Brons ...	I.	74	...	1,104	362	327	1,030	2,724	39	6,560
	II.	369	...	2,685	1,358	737	3,157	4,613	46	12,965
	III.	1,935	...	7,154	5,324	2,462	6,964	9,125	85	33,049
	IV.	5,360	...	18,612	25,418	10,085	12,393	23,074	292	95,234
		7,738	...	29,555	32,462	13,611	24,444	39,536	462	147,808
		69,994	3,956	93.876	240,605	80,045	62,287	153,319	9,847	713,930

Grouped together, oaks yield the following figures :—

Girth-class.	Nalena block	Kuria block.	Laria Kánta block.	Bhawáli block.	Budhlá-kot block.	Jákh block.	Chína block.	Ayárpáta block.	Entire forest.
I. ...	459	47	4,875	3,264	2,278	3,094	8,567	731	23,315
II. ...	1,116	127	5,854	6,123	3,229	3,121	9,518	667	29,755
III. ...	3,350	351	11,025	19,057	6,242	4,697	19,612	1,278	65,612
IV. ...	8,593	1,106	21,919	62,668	13,586	9,076	55,492	6,495	178,935
Total ...	13,518	1,631	43,673	91,112	25,335	19,988	93,189	9,171	297,617

The Proposed Reserve.

During the five weeks of field work available since these forests have been taken up it has been possible to count only the chír trees covering gregariously a sufficiently large area, but in some of these areas sál, sain, oaks, and brons and ayar also have been enumerated. The girth-classes employed have been the same as those adopted in the protected forests.

The area marked A on the map will probably all be taken over by the Military Department. Allowing for this, the standing stock of chír is as follows :—

Chír	I.	3,498
„	II.	8,683
„	III.	11,890
„	IV.	30,336
	Total ...	54,407

It would be idle to estimate the number of individuals of other species ; but the details of the actual countings, including that of chír, may be given thus :—

Species.	Girth-class.	*Number of trees in* B.—D. Area, acres.	E. Area, acres.	F. Area, acres.	G.—J. Area, acres.	K.—P. Area, acres.	Q.—R. Area, acres.	S. Area, acres.	Entire area, acres.
Chir ...	I	198	88	46	710	1,642	736	78	3,498
	II	569	152	120	1,566	4,927	1,069	280	8,683
	III	1,162	213	201	1,837	7,444	574	459	11,890
	IV	10,714	442	486	1,929	14,310	550	1,905	30,336
		12,643	895	853	6,042	28,323	2,929	2,722	54,407
Sál ...	I	...	...	...	35	No other species counted but chír.	No other species counted but chír	No other species counted but chír	
	II	...	...	...	215				
	III	...	...	...	1,292				
	IV	...	...	...	4,863				
		...	...	...	6,405				
Sain ...	I	...	...	...	93				
	II	...	...	...	371				
	III	...	...	...	1,194				
	IV	...	...	...	2,512				
		...	...	...	4,170				
Bánj ...	I	...	10	42	226				
	II	...	78	82	582				
	III	12	200	248	1,202				
	IV	15	208	301	1,350				
		27	496	673	3,360				
Brons ..	I	...	...	...	3				
	II	...	...	3	10				
	III	...	...	19	109				
	IV	...	...	38	196				
		...	...	60	318				
Ayár ...	I	...	...	1	6				
	II	...	...	2	25				
	III	...	...	12	100				
	IV	...	...	29	268				
		...	...	44	399				
Total ...	...	12,670	1,391	1,630	20,694				

SECTION IV.—PLANTATIONS.

I am indebted to Mr. Braidwood for the following account of the plantations in these forests :—

Running number.	Name.	Year in which Commenced.	Year in which Completed.	Year in which Abandoned.	Area in acres.	Species.	Method employed.	Degree of success.
1	Ayárpáta	1875 ...	...		8	Tilonj	Beds 2′ × 1′ dug 1 foot deep, acorns dibbled in 9 to a bed ...	Good.
2	CHINA. Nairwári	1880 ...	...		43	Walnut and ash	Walnut plants from Ránikhet; ash plants from seeds sown at Bhadli 18, 19.	Do.
3	Deopáta	1876 ...	...		47	Deodar, walnut, ash, horse-chesnut, and tilonj.	Deodar and walnut plants from Ránikhet, except 500 from Jabar nursery; ash plants from seeds sown in Nos. 18, 19; horse-chesnuts from seed sown in No. 7; tilonj from seed.	Do.
4	China	1880 ...	...		3·2	Riánj	From seed	Do.
5	Ditto	1884 ...	...		3	Wild poplar, kharsu	Poplar, from natural seedlings at Kahla; kharsu from seed ...	Do.
6	Ditto	1876 ...	...		30	Deodar, walnut, and ash ...	Deodar, walnut and ash, 1st, half from Jabar nursery and half from Ránikhet, all the 2nd from Ránikhet and all the 3rd from Bhadli, Nos. 18, 19.	Do.
7	Ditto	1876 ...	...		19	Horse-chesnut, riánj, tilonj, bánj, and ash.	1st from Ránikhet, 2nd, 3rd, and 4th from seed, 5th plants from Bhadli, Nos. 18, 19.	Horse-chesnut partial, others good.
8	Ditto	1878 ...	...		21	Pinus excelsa, bánj, walnut, horse-chesnut, and ash.	1st 3rd and 4th from Ránikhet, 2nd from seed, 5th plants from Bhadli, Nos. 18, 19.	Partial.
9	Ditto	1884 ...	...		0·5	Deodar	Plants from Ránikhet	Good.
10	Ditto	1884 ...	...		0·5	Ditto	Ditto ditto	Do.
11	Ditto	1880 ...	...		19	Ditto	A little from seed, the greater part plants from Ránikhet ...	Do.
12	Ditto	1879 ...	...		0·9	Ditto	Plants from Ránikhet	Do.
13	Malla Liuta	1877 ...	...		4	Ash, walnut, and bánj ...	Ash seedlings from Bhadli, Nos. 18, 19; walnut from Ránikhet; bánj from seed.	Oak partial.
14	Talla Liuta	1877 ...	...		6	Bánj	... ...	Failure.
15	Kiládhungi	1877 ...	...		21	Deodar, walnut, ash, and kharsu ...	Deodar and walnut from Ránikhet; kharsu sown; ash seedlings from Bhadli.	Good.
16	Bhádli	1879 ...	...		11	Ash	Sown	Do.
17	Kiládhungi	1882 ...	...		4	Do.	Ditto	Do.
18	Bhádli (Bángwála)	1879 ...	...		16	Do.	Ditto	Do.
19	Bhádli nursery	1879 ...	...		1·5	Do.	Ditto	Transplanted, only a few left.

Running number.	Name.	Year in which Commenced.	Completed.	Abandoned.	Area in acres.	Species.	Method employed.	Degree of success.
20	Talla Bhádli	1879	...	...	6	Bánj	Sown	Good.
21	Mauláni	1879	...	...	49	(1) bánj, (2) tilonj, (3) kharsu, (4) riánj, (5) ash, (6) walnut, and (7) fruit trees.	1st to 4th from seed; 5th, plants from Káládhungi, No. 17; 6th and 7th, plants from Ránikhet.	Do.
22	Chhatráni	1879	...	...	6	Bánj and chír	From seed	Not good.
23	Ditto	1879	...	...	1·4	Ditto	Ditto	Good.
24	Ditto	1879	...	...	2	Ditto	Ditto	Do.
25	Ditto	1879	...	...	0·5	Bánj	Ditto	Partial.
26	Ditto	1879	...	...	1	Do.	Ditto	Do.
27	Talla Káhla	1884	...	...	13	Walnut	Plants from Ránikhet	Good.
28	Malla Káhla	1877	...	...	26	Deodar, walnut, bastard tun (dalla).	Deodar and walnut from Ránikhet; dalla natural seedlings ...	Do.
29	Chorsa	1881	...	...	22	Walnut, deodar, and bánj ...	Deodar and walnut from Ránikhet; bánj from seed	Partial.
30	Jábar	1876	...	...	95	Deodar	Except about 4,500 from nursery, the plants were from Ránikhet,	Good.
	Jábar nursery	1875	...	...	...	...	All transplanted	Do.
	Udiári khet	1883	...	...	...	Bánj	From seed	Do.
	Basáni	1883	...	...	...	Do.	Ditto	Do.
	Jukiya	1883	...	...	...	Do. and riánj	Ditto	Partial.
	Bajela	1883	...	...	...	Do.	Ditto	Good.

In a general manner it may be said (1) that distances vary: they were intended to be 12 feet in lines 10 feet apart, but owing to the steepness and irregularity of the ground they are nearly all less; (2) that when seed was sown patches 2′ × 1′ were made, the soil being loosened to a depth of one foot; (3) that where transplants were put down, pits 18″ × 18″ × 18″ were prepared; (4) that only those species which are *now* on the ground have been sown: other species were put down, but have failed; and (5) that figures of cost cannot be given, as the expenditure cannot be separated.

CHAPTER III.—Economic conditions.

The following points will be considered in this chapter :—

I.—Description of produce the forests can yield.
II.—Requirements to be met.
III.—Communications and mode of export.
IV.—Mode of working and selling and working rates.
V.—Past revenue and expenditure.

Section I.—Description of produce the forests can yield.

In respect of timber the forests can furnish chír principally and, in very much smaller quantity, sál and sain. Of tun and ash there is scarcely enough to guarantee the most trifling steady supply. Cypress is slightly more abundant, but not enough so to be regularly worked. Timber for agricultural and garden purposes and for small woodware can be furnished by the oaks, sál, *Bœhmeria rugulosa*, *Pistacia integerrima*, maples, &c.

As regards fuel, all the trees and shrubs here are more or less suitable. Those which, like brons, do not give a good firewood, nevertheless make good charcoal for one purpose or another. Under any circumstances a large proportion of the fuel must be supplied by chír.

Minor produce is obtainable in the shape—(*i*) of fodder and thatching-grass ; (*ii*) of dead pine needles in small quantities for litter ; (*iii*) of leaf-fodder and green leaf-manure lopped from trees to be felled or headed or from others under due control ; (*iv*) of chír resin and its products in large quantities ; (*v*) of fruit such as kaphal, bramble-berries, barberry, wild pear, &c. ; (*vi*) of chír and other bark for tanning and for smithy purposes, and (*vii*) of fibre for paper-making, &c.

Lastly, there are extraneous products, such as limestone and building stone.

Section II.—Requirements to be met.

The principal of these requirements are :—

(1) Gratuitous supply of various forest products to villagers.
(2) Timber for the settlement.
(3) Firewood for the troops at the depôt.
(4) Ditto other inhabitants of the settlement.
(5) Ditto graziers residing outside the settlement.
(6) Charcoál.
(7) Fuel for lime-burning.
(8) Grazing and fodder grass for animals in the settlement and those belonging to butchers and milkmen.

Article I.—Requirements of right-holders.

Right-holders in the protected forest.

The nature of the rights have been described in Chapter I., Section II. Here it is necessary to further define them.

In the accompanying tabular statement are shown side by side the number of cattle allowed to graze and the number which actually graze. It will be observed that strict comparison between the respective numbers for each village is not possible ; this is due to the fact that the authoritative list has been apparently incorrect from the first as respects the names of the villages. That list gives just double the

number of head shown by the patwáris in their returns. The reason for doubling the number was to allow a sufficient margin for future increase:—

Patti.	Mauza.	*Number entitled to graze.*					*Number actually grazed.*					Remarks.
		Cows.	Buffaloes.	Sheep.	Goats.	Total.	Cows.	Buffaloes.	Goats.	Horses.	Total.	
Pahár Chhakháta.	Belwa Khán and Lagga.	376	358	...	88	822	9	1	5	1	16	
	Jiolikot ...	...	...	...	...	...	No mention of these two villages in forest officer's list.					
	Jioli	...	...	...	...	...						
	Gothia	210	60	2	92	364	54	17	15	3	89	
	Charta	184	8	...	2	194	24	1	2	...	27	
	Naikána ...	60	14	...	...	74	11	9	5	...	25	
	Balni Khán ...	42	62	...	...	104	No mention of this village in forest officer's list.					
	Manora ...	...	...	...	...	...	6	2	...	...	8	
	Deoldhunga ...	26	30	...	...	56	4	2	...	...	6	
	Chhopra and Lagga	322	164	...	10	496	No mention of these two villages in forest officer's list.					
	Gájari Khet ...	...	...	...	...	...						
	Basgáon ...	56	14	...	...	70	18	8	1	...	27	
	Ria	10	48	...	...	58	7	10	...	...	17	
	Rhaupara ...	...	...	...	...	...	20	5	1	1	27	
	Matiála ...	26	...	...	...	26	4	...	...	...	4	
	Bhaliuti ...	114	90	...	...	204	47	38	1	3	89	
	Saria Tál ...	168	28	...	...	196	69	17	...	3	89	
	Kuriagáon ...	252	104	...	22	378	81	25	4	5	115	
	Nagyari ...	60	48	...	...	108	26	7	...	...	33	
	Kahal Kuira ...	136	...	...	2	138	No mention of this village in forest officer's list.					
Pahár Kotah Dhania Kot.	Adhora ...	200	90	...	24	314	8	6	...	...	14	
	Káphalta ...	310	...	...	15	325	210	9	...	1	220	
	Budhla Kot ...	157	...	...	34	191	101	2	29	8	140	
	Sabjia	17	10	...	1	28	26	16	3	2	47	
	Garjia	11	36	...	3	50	No mention of this village in forest officer's list.					
	Pangot... ...	134	52	...	2	188	111	34	...	3	148	
	Jákh	123	11	...	15	149	30	2	6	2	40	
	Chorsa, naya and purana.	20	6	...	76	102	75	10	49	3	137	
	Dahria ...	56	...	...	...	56	No mention of this village in forest officer's list.					
	Bhawáli ...	61	35	...	68	164	127	42	38	7	214	
	Sirori	30	13	...	12	55	57	25	28	2	112	
	Pádli	87	...	..	9	96	68	...	2	2	72	
	Ghúna	31	3	...	2	46	45	8	10	2	65	
	Ninglát Malla ...	8	...	...	5	13	No mention of these villages in the forest officer's list.					
	Ditto Talla ...	43	...	...	2	45						
Pahár Chhakháta.	Bárgal	125	23	...	24	172	94	2	4	5	105	
	Brewery ...	No mention of these villages or localities in the authorized list.					6	...	...	...	6	Equivalent perhaps to Charta?
	Arukhán ...						5	13	...	...	18	Balni Khán?
	Gájá						13	1	11	2	27	Belwa Khán?
	Bhúmia Dhár ...						8	9	1	1	19	Chhopra?
	Sakniáni ...						...	1	...	...	1	Balni Khán or Naikána?
Pahár Kotah Dhania Kot.	Churáni ...						4	3	...	...	7	Dahria.
	Bhura Patal ...						2	5	4	...	7	Garjoli?
	Bagarh ...						116	31	...	...	151	Pangot?
	Gair Khet ...						9	3	...	...	12	In authorized list.
	Total ...	3,455	1,317	2	508	5,282	1,495	364	219	56	2,134	

The total number of standing or entire trees given to the villagers during the past five years has been as shown in the statement below :—

Species.	Number of trees of girth-class.				
	I.	II.	III.	IV.	Total.
Chír	107	33	119	329	588
Oaks	13	...	27	...	40
Sándhan	...	1	2	...	3
Semal	...	1	1	...	2
Gethi (*Bœhmeria regulosa*)	1	11	13	...	25
Garur	1	1	1	...	3
Sál	...	1	16	...	17
Tun	...	...	1	...	1
Miscellaneous	...	...	7	3,686	3,693

Besides the above timber, the men received 1,700 slabs and backs from the chír sawings.

There is no means of estimating the quantity of other descriptions of produce consumed by the villagers. The only kind, however, which concerns the present working plan is firewood, and the annual consumption of this may be put down at 75,000 maunds, of which at least 25,000 maunds come from other sources, for some of the villages are situated in or border other Government forest areas and some have trees growing on their fields. The estimate is arrived at by assuming that there are 500 houses which burn on an average 150 maunds each per annum. In connection with this statement it must be remembered that most of the inhabitants are down in the Bhábar during the seven coldest months of the year.

The proposed Reserve.

The settlement of this area under the Forest Act being still in progress, the extent of the requirements of right-holders cannot be given. The area is honeycombed with extensive cultivation, and hitherto there has apparently been no check on the wasteful employment of timber by the villagers, who, without careful supervision, will always destroy a great deal of wood in conversion, and will also employ a large proportion of it in such a way as to induce rot and decomposition in the shortest possible time. It must, moreover, be remembered that the number of standing chír given to villagers enjoying rights in the protected forest is diminished to a certain extent by the slabs and backs given to them from the sawing refuse, of which there will be none available for the men in the proposed reserve. It is hence permissible to assume that the rights, in respect of standing trees at any rate, will be 50 per cent. heavier than in the protected area, and the number of trees required annually will thus probably be as follows :—

Species.	Number of trees of girth-class.				
	I.	II.	III.	IV.	Total
Chír	32	10	36	99	177
Oaks	4	...	8	...	12
Other species	1	5	12	1,100	1,118
Total	37	15	56	1,199	1,307

The consumption of firewood will, owing to the lower elevation and the proximity of the Bhábar, be less than in the protected forest, and may, therefore, be put down at 60,000 maunds per annum, of which 20,000 maunds will come from the tree-covered land surrounding the villages.

Article 2.—Timber for the settlement.

The timber for the settlement is supplied—(i) by departmental agency, and (ii) by purchasers of standing trees.

I.—Timber supplied by Departmental Agency.

In the appended statement are exhibited the various descriptions of timber and the quantity of each supplied during the past seven years.

Statement showing the number and contents of the various descriptions of boards and scantlings sawn up departmentally from 1879-80 *to* 1885-86.

Species.	Description of sawn timber			1879-80.		1880-81.		1881-82.		1882-83.		1883-84.		1884-85.		1885-86.		Totals.		Average per annum.	
	Name.	Dimensions.	Contents of each piece in cubic feet.	Number.	Contents in cubic feet.	Number.	Contents in cubic feet.	Number.	Contents in cubic feet.	Number.	Contents in cubic feet.	Number.	Contents in cubic feet.	Number.	Contents in cubic feet.	Number.	Contents in cubic feet.	Number.	Contents in cubic feet.	Number.	Contents in cubic feet.
		Ft. in. in.	Ft. in. in																		
Chir	Planks.	10 × 6 × ¾	0 3 9	1,576	492	6,738	2,106	7,319	2,287	5,450	1,703	3,059	956	7,733	2,417	2,591	810	34,466	10,771	4,924	1,539
		10 × 6 × 1	0 5 0	1,457	607	2,737	1,140	2,236	932	3,592	1,497	953	397	4,157	1,732	1,179	491	16,311	6,796	2,330	971
		10 × 6 × 1½	0 7 6	218	136	538	336	2,260	1,412	534	334	1,118	699	1,604	1,002	2,734	1,709	9,006	5,628	1,487	804
		10 × 6 × 2	0 10 0	172	143	461	384	496	413	54	45	163	136	333	277	227	189	1,906	1,587	272	227
		10 × 12 × ½	0 5 0	1,022	426	672	280	2,662	1,109	2,137	890	3,654	1,522	6,341	2,642	812	338	17,300	7,209	2,471	1,030
		10 × 12 × ¾	0 7 6	48	30	166	104	2,479	1,549	1,174	734	1,448	905	3,267	2,042	1,819	1,137	10,401	6,501	1,486	929
		10 × 12 × 1	0 10 0	1,488	1,240	671	559	1,775	1,479	2,286	1,905	1,774	1,478	1,818	1,515	905	754	10,717	8,930	1,531	1,276
		10 × 12 × 1½	1 3 0	1,242	1,552	1	1	261	326	627	784	141	176	432	540	616	770	3,320	4,149	474	593
		10 × 12 × 2	1 8 0	681	1,135	29	48	127	212	141	235	12	20	103	172	6	8	1,098	1,830	157	261
	Karis.	01 × 5 × 3	1 0 6	245	255	369	384	167	174	493	514	135	141	364	379	468	487	2,241	2,334	320	333
		10 × 5 × 4	1 4 8	349	485	87	121	137	190	553	768	65	92	498	692	399	554	2,089	2,902	298	415
		10 × 6 × 3	1 3 0	64	80	268	335	297	371	133	166	1	1	402	502	272	340	1,437	1,795	205	256
		10 × 6 × 4	1 8 0	125	208	16	27	8	13	24	40	2	3	264	440	144	240	583	971	83	139
		12 × 5 × 3	1 3 0	298	372	829	1,036	257	321	50	62	22	27	357	446	688	860	2,501	3,124	357	446
		12 × 5 × 4	1 8 0	644	1,073	173	288	84	140	641	1,068	96	160	467	778	904	1,507	3,009	5,014	430	716
		12 × 6 × 3	1 6 0	51	76	246	369	327	490	23	34	1	1	75	112	214	321	937	1,403	134	200
		12 × 6 × 4	2 0 0	355	710	45	90	13	26	24	48	...	...	101	202	125	250	663	1,326	95	189
		14 × 5 × 3	1 5 6	107	156	510	744	81	118	256	373	53	77	177	258	623	909	1,807	2,635	258	376
		14 × 5 × 4	1 11 4	101	196	85	165	203	395	362	704	122	237	248	482	374	727	1,495	2,906	214	415
		14 × 6 × 3	1 9 0	48	84	306	535	246	430	20	35	...	...	28	49	83	145	731	1,278	104	183
		14 × 6 × 4	2 4 0	76	177	20	47	27	63	31	72	2	5	22	51	46	107	224	522	32	75
		16 × 5 × 3	1 8 0	498	830	7	12	18	30	24	40	49	82	58	97	102	170	756	1,261	108	180
		16 × 5 × 4	2 2 8	479	1,064	1	23	86	191	99	220	3	7	172	382	74	165	914	2,052	131	293
		16 × 6 × 3	2 0 0	41	82	72	144	29	58	21	42	2	4	43	86	18	36	226	452	32	65
		16 × 6 × 4	2 8 0	329	877	4	11	21	56	6	16	...	...	53	141	4	11	417	1,112	60	159
Total of scantlings kept in stock according to agreement				11,714	12,486	15,051	9,289	21,616	12,789	18,755	12,329	12,876	7,126	29,117	17,436	15,426	13,035	124,555	84,488	17,794	12,070
Other scantlings				5,171	7,816	4,344	4,609	4,868	4,888	2,341	2,451	1,289	1,509	1,740	2,298	1,643	1,484	21,396	25,055	3,056	3,579
TOTAL OF CHIR				16,885	20,302	19,395	13,898	26,484	17,677	21,096	14,780	14,165	8,635	30,857	19,734	17,069	14,519	145,951	109,543	20,850	15,649

Statement showing the number and contents of the various descriptions of boards and scantlings sawn up departmentally from 1879-80 *to* 1883-84—(concluded).

Species.	Description of sawn timber.			1879-80.		1880-81.		1881-82.		1882-83.		1883-84.		1884-85.		1885-86.		Total.		Average per annum.	
	Name.	Dimensions.	Contents of each piece in cubic feet.	Number.	Contents in cubic feet.	Number.	Contents in cubic feet.	Number.	Contents in cubic feet.	Number.	Contents in cubic feet.	Number.	Contents in cubic feet.	Number.	Contents in cubic feet.	Number.	Contents in cubic feet.	Number.	Contents in cubic feet.	Number.	Contents in cubic feet.
Ash ...	Plank ...	?	?	...	...	...	...	51	34	...	...	...	...	11	8	20	11	82	53	12	8
	Karis ...	?	?	...	...	...	...	8	11	...	...	...	...	2	2	9	10	19	23	3	3
Tun ...	Planks ..	?	?	...	...	...	...	75	64	...	...	...	...	...	...	...	...	75	64	11	9
	Karis ...	?	?	...	...	...	...	3	3	...	...	...	...	...	...	...	...	3	3	1	1
Shisham...	Planks...	?	?	...	...	...	...	17	12	...	...	...	...	...	...	...	...	17	12	2	2
Alder ...	" ...	?	?	...	...	...	...	151	147	...	...	...	...	...	...	...	...	151	147	22	21
		Total	..	...	...	...	...	305	271	...	...	...	...	13	10	29	21	347	302	50	43

II.—Timber supplied by Private Agency.

This timber is obtained both from the forests of the Naini Tal sub-division and from other neighbouring chír forests.

That exported from the former during the past four years has been as follows :—

Species.	Number of trees of girth-class.				
	I.	II.	III.	IV.	Total.
Chír	40	98	83	24	245
Alder	13	1	...	...	14
Sál	...	1	...	...	1
Gethi	...	4	7	...	11
Ash	...	1	...	...	1
Tun	3	1	...	...	4
Total ...	56	106	90	24	276

The quota imported from other forests cannot be ascertained.

III.—General Remarks.

Mr. Braidwood, whose experience at Naini Tal extends over 12 years, estimates the average annual quantity of sawn chír timber consumed at 20,000 cubic feet. That figure also includes a few trees supplied to the Public Works and Postal Departments and used by the Forest Department itself.

Article III.—Firewood for the troops at the depôt.

During the past seven years the following quantities have been supplied :—

1879-80	29,061	maunds of 100lb.	
1880-81	27,581	"	"
1881-82	27,619	"	"
1882-83	27,260	"	"
1883-84	21,027	"	"
1884-85	25,862	"	"
1885-86	19,380	"	"
Total ...	177,790	"	"
Annual average ...	25,400	"	"

The average proportion of pine to hard woods has been as 2 : 1.

Article IV.—Firewood for civil population of settlement.

The inhabitants obtain their firewood by means of tickets obtained from the forest office and renewed monthly. Each ticket-holder brings on an average 20 100lb maunds in a month. The number of tickets sold annually during the past five years has been :—

		Rs.
1881-82	...	2,772
1882-83	...	3,252
1883-84	...	3,328
1884-85	...	3,690
1885-86	...	3,659
	Total ...	16,701
	Average ...	3,340 per annum.

Allowing for a probable increase to the population, we may put down the annual average at 4,000 tickets, thus making a demand of 80,000 maunds per annum.

Article V.—Wood for graziers and other residing outside the settlement.

These are exclusive of the villagers and come up during the season in order to supply milk and meat. There are no data for gauging accurately their requirements ; but the number of this floating population is very limited (say, at the outside, 200 individuals) and the annual requirements in respect of firewood cannot exceed 12,000 maunds, a large proportion of which is small wood.

The timber these people require is for building and repairing the sheds in which they pen their cattle at night or live themselves. The total number of trees of miscellaneous species which they have taken during the past five years has been as follows :—

Girth-class	I.	...	...	...	26 or 5	per annum	= 200	maunds.
„ „	II.	...	...	...	16 „ 3	„	= 60	„
„ „	III.	...	...	...	33 „ 7	„	= 56	„
„ „	IV.	...	...	...	7,653 „ 1,531	„	= 3,062	„
						Total	= 3,378	

Thus the total annual requirements are roughly 16,000 maunds of the class of wood, which have been estimated for as firewood.

Under "others" are included the forest work-people and wayfarers. The former require huts and will, when work is in full swing, number about 1,000 individuals. Their requirements may be estimated at 40,000 maunds annually, most of it, however, being small refuse excluded from the estimate of exploitable stock.

Article VI.—Charcoal.

Charcoal for cooking is made from hard woods. The Forest Department has never supplied the entire requirements of the settlement, which may be estimated at 20,000 maunds of 80lb annually, representing 80,000 100lb maunds of wood. This charcoal sells in the settlement at one rupee per maund of 80lb, and can therefore stand coolie carriage up to 12 miles. For many years a very large proportion of the supply came from the Bhábar after 12 miles of cartage and 8 of coolie carriage.

The charcoal used by iron and goldsmiths is all from chír, and the average annual consumption is only 800 80lb maunds, representing 3,200 100lb maunds of wood. Although it is sold at the same rate as hard-wood charcoal, it can all come from within seven miles of the settlement.

Article VII.—Fuel for lime-burning.

The average quantity of lime for mortar and plaster used annually in the settlement and in the villages cannot be far short of 15,000 maunds ; and similarly the

average quantity of lime for whitewash wanted every year may be put down at 2,000 maunds. From 60 to 70 maunds of hard woods are required to burn 100 maunds of lime. We may, therefore, estimate the demand for burning lime for the settlement at 11,000 100lb maunds of firewood per annum. Of this quantity 4,000 maunds will always be forthcoming from the municipal forests in the shape of windfalls, dead trees, and trees removed in thinnings and for the extension of gardens and building sites. Thus 5,000 100lb maunds of firewood will have to be provided every year from other sources. It is evident that this wood must be supplied as near the sources of the limestone as possible.

Article VIII.—Grazing and fodder grass for the general public.

From this head only right-holders and their cattle are excluded.

The number of head of cattle and sheep and goats to be provided for is shown in the appended statement, which gives the average figures of the last five years. The largest number grazed during that period was in 1881-82, *viz.*, 2,481 head of all kinds, and the lowest number (1,746) in 1883-84. By far the largest proportion of these animals belong to milkmen and butchers ; the remainder to residents of the settlement, who mostly send their cattle for the day to the cantonment forests.

List of cattle paying grazing dues.

Locality.	Cows.	Buffaloes.	Goats.	Horses.	Total.
Gairkhet	3	1	...	...	4
Charta	59	8	6	1	74
Naikána	8	8	1	...	17
Manora	7	8	...	...	15
Nalena	1	1	...	...	2
Kalona	13	25	...	...	38
Patwadangar	20	56	...	1	77
Bhaliuti	2	...	1	1	4
Gaja	7	4	16	4	31
Brewery	6	3	...	1	10
Arukhán	24	83	...	...	107
Debuajála	1	...	...	...	1
Kímukhet	8	5	1	...	14
Dewaldhúnga	8	6	1	...	15
Gothia	24	11	17	1	53
Dhák-ka-khet	4	...	1	...	5
Seri	12	21	2	...	35
Sakniáni	3	2	...	...	5
Bhawáli	3	3	...	1	7
Kuria	25	14	8	...	47
Bhumiadhar	23	16	8	...	47
Nagunari	15	...	6	3	24
Mujhar	15	14	1	...	30
Tirchakhet	1	7	...	...	8
Udiari	...	3	...	...	3
Jokia	16	5	1	1	23
Shamela	5	13	...	...	18
Jabar	2	11	...	...	13
Hinan	8	...	3	1	12
Chorsa	3	3	...	...	6
Dhunikhal	25	1	...	...	26
Pangot	...	...	1	...	1
Chína	...	10	...	...	10
Syamkhet	2	...	...	...	2
Ria	...	10	...	...	10
Sirori	2	...	...	...	2
Ghuna	1	...	...	...	1
Gognani	6	13	...	1	20
Ninglat	...	12	...	...	12
	362	375	75	16	828

There is no means of ascertaining with any near degree of approximation the quantity of fodder and thatching-grass required in the settlement. As most of the houses are roofed with iron, the amount of the latter must be very small, perhaps not more than 500 maunds per annum. As regards fodder (including litter) grass, we may, in order to estimate it, assume that there are 400 horses and ponies and 200 cows. At least half these latter graze during the day in the cantonment forests, so that we may put down 40 and 20lb respectively as the daily allowance per horse

and cow, thus making a total demand of 20,000lb. per diem or 4,000,000lb. per annum. This is easily supplied from the immediately adjoining portions of the forests except during April—May, when the grass-cutters have sometimes to go as far as four miles from the settlement.

SECTION III.—COMMUNICATIONS AND MODE OF EXPORT.

The cart-road from Ránibágh to the cantonment traverses the south-eastern portion of the protected forests for a distance of about 12 miles, but the ascent on that side is so great (3,000 feet in that distance) and the direct approach so short (hardly six miles) that coolie carriage is found to be more economical than cartage.

A new cart-road is being made to Ránikhet from a point of the former road just above the village of Gethia, past Bhungád and Siámkhet, and thence along the right bank of the Bhawáli or Ninglát stream, to the most northerly point of the forests. This road will be useful for the partial cartage of a small portion of both timber and fuel from the portion of the forest beyond Siámkhet; but it will serve most of all to render accessible the Ninglát forests, which are referred to in Part III of the Report.

All the other roads are either broad district bridle-roads, such as those going to Ránikhet and Ránibagh, or forest bridle-roads and paths. The portions best provided with roads are the Bhawáli and Laria Kánta blocks, the northern half of the Nalena block, the southern half of the Jákh block, and the eastern half of the China block. These have been the most heavily worked portions. The Budhlákot block is extremely difficult of access.

The proposed reserve is traversed by the broad district bridle-road going to Káládhungi, which road branches off near Banjaon to Dechauri. Save these two roads there are no other roads or made paths.

The cost of construction per mile of the various forest paths and bridle-roads is as follows: -

Width 2 feet	...	...	...	...	Rs.	5—15,	average	Rs.	10
„ 3 „	...	...	...	...	„	20—40	„	„	30
„ 4 „	...	...	...	...	„	25—45	„	„	35
„ 5 „	...	...	...	...	„	40—80	„	„	60
„ 6 „	...	...	...	...	„	90	„	„	90

Pony or mule carriage has never been used, the Dotial cooly being able to carry more than half a mule-load for less than half the hire of a mule and giving no trouble in loading, unloading and supervision, and requiring much less expensive roads.

SECTION IV.—MODE OF WORKING AND SELLING AND WORKING RATES.

This subject will be best dealt with under four headings—(I) timber; (II) fuel; (III) other descriptions of wood; and (IV) minor produce.

Article 1.—Timber.

Under agreement with the civil authorities, the Forest Department has engaged itself to supply the requirements of the settlement in ready-sawn chír scantlings, the civil authorities, on the other hand, engaging not to sell timber from their own forests. Actually this agreement has not been strictly carried out on either side, the Forest Department having never been able to meet the entire demand, and the Civil authorities being perhaps too willing to supply timber from their own forests. The best guarantee for the maintenance of this agreement, at least in the spirit, has been the greater remoteness and inaccessibility of the forests belonging to the Civil Department.

A further term of the agreement is that the Forest Department shall charge only such rates as are approved by the Commissioner. The equity of this condition is, to say the least, questionable, especially after the ruling of the Government of India that the Forest Department, in carrying on its transactions, must be guided by purely and strictly business principles. No doubt the possession of the nearest supply of timber gives the Department a practical monopoly, which, like all monopolies, is

liable to be abused, if obedience to business principles is carried to excess But a great State Department is not a private individual, whose interests are entirely distinct from those of the general community, which the State, not less by its forest than by its Civil Department, represents; and the direct supervision of the Government through its secretariat is surely a sufficient guarantee that the monopoly will not be abused. The present arrangement, it is good to speak out, is productive of considerable friction between two departments, which being only two different branches of one and the same Government, ought certainly to work harmoniously one with the other.

The descriptions of chír boards, battens and scantlings that must always be kept in stock and their sanctioned selling prices at the depôt are shown in the subjoined statement. The present depôt is at Kahla, at the northern end of the St. Loo Gorge, about two miles north of the lake. The statement also gives an analysis of cost and the net value per sawn cubic foot :—

Serial number.	Dimensions. Length.	Breadth.	Thickness.	Contents in cubic feet.	Price.	Per.	Price per cubic foot in annas.	Cost. Superficial feet of sawing paid for.	Sawing, including commission of 1 per cent. to headman.	Carriage.	Proportion of cost of special establishment at 7 pies per cubic foot.	Total.	Cost per cubic foot in annas.	Net value per cubic foot in annas.
	ft.	in.	in.		Rs. a. p.				Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.		
1	10	6	¾	0·315	29 0 0	100pieces	14·85	5	0 1 11·1	0 0 7·5	0 0 2·2	0 2 8·8	8·68	6·17
2	...	...	1	0·417	32 0 0	"	12·29	5	0 2 1·2	0 0 10	0 0 2·9	0 3 2·1	7·61	4·68
3	...	...	1½	0·630	43 0 0	"	11·01	5	0 2 1·89	0 1 3	0 0 4·4	0 3 9·3	5·99	5·02
4	...	...	2	0·834	52 0 0	"	9 98	6	0 2 4·35	0 1 8	0 0 5·84	0 4 6·2	5·41	4·57
5	...	12	½	0·417	50 0 0	"	12.00	10	0 2 10·35	0 0 10	0 0 2·9	0 4 5·3	10·65	1·35
6	...	...	¾	0·625	58 0 0	"	14·85	10	0 4 5·4	0 1 3	0 0 4·4	0 6 0·8	9·71	5·14
7	...	...	1	0·833	66 0 0	"	12·67	10	0 4 8·7	0 1 8	0 0 5·8	0 6 10·5	8·25	4·42
8	...	...	1½	1·250	90 0 0	"	11·52	10	0 4 10·8	0 2 6	0 0 8·7	0 7 11·8	6·88	5·14
9	...	...	2	1·667	120 0 0	"	11·52	11	0 5 3	0 3 4	0 0 11·7	0 9 6·7	5·73	5·79
10	10	5	3	1·042	0 12 0	each	11·52	6·7	0 3 1·8	0 2 0	0 0 7·3	0 5 9·1	5·53	5·99
11	...	...	4	1·389	1 0 0	"	11·52	7·5	0 3 4·9	0 2 9	0 0 9·7	0 6 11·6	5·01	6·51
12	...	6	3	1·250	0 15 0	"	12·00	7·5	0 3 4·9	0 2 6	0 0 8·7	0 6 7·6	5·31	6·69
13	...	...	4	1·667	1 4 0	"	12·00	8·3	0 3 11·2	0 3 4	0 0 11·7	0 8 2·9	4·95	7·05
14	12	5	3	1·250	0 15 0	"	12·00	8	0 3 11·2	0 2 6	0 0 8·7	0 6 1·9	4·93	7.09
15	...	...	4	1·667	1 4 0	"	12·00	9	0 4 5·5	0 3 4	0 0 11.7	0 8 9·2	5·26	6·74
16	...	6	3	1·500	1 2 0	"	12·00	9	0 4 5·5	0 3 0	0 0 10·5	0 8 4·0	5·56	6·44
17	...	...	4	2·000	1 8 0	"	12·00	10	0 4 8·7	0 4 0	0 1 2	0 9 10·7	4·95	7·05
18	14	5	3	1·458	1 2 0	"	12·34	9.3	0 4 6·6	0 3 0	0 0 10·2	0 8 4·8	5·76	6·58
19	...	...	4	1·944	1 8 0	"	12·34	10·5	0 4 11·8	0 4 0	0 1 1·6	0 10 1·4	5·20	7·14
20	...	6	3	1·750	1 5 0	"	12·00	10·5	0 4 11·8	0 3 6	0 1 0·25	0 9 6·	5·46	6·54
21	...	...	4	2·333	1 12 0	"	12·00	11·7	0 5 6·1	0 4 8	0 1 4·3	0 11 6·4	4·94	7·06
22	16	5	3	1·667	1 8 0	"	14·40	10·7	0 5 6·1	0 3 4	0 1 11·7	0 10 9·8	6·49	7·91
23	...	...	4	2·222	2 0 0	"	14·40	12	0 6 0·4	0 4 6	0 1 3·6	0 11 10	5.33	9·07
24	...	6	3	2·000	1 12 0	"	14·00	12	0 6 0·4	0 4 0	0 1 2	0 11 2·4	5·60	8·40
25	...	...	4	2·667	2 5 0	"	13·87	13·3	0 6 6·7	0 5 4	0 1 6·7	0 13 5·4	5·04	8·83

It will be observed that the net value per sawn cubic foot does not increase sufficiently with the increasing dimensions of the scantlings. Boards 12 inches wide should surely be worth at least 30 per cent. more net than battens of the same thickness only 6 inches wide, and so on. If the Department were free in its action, the anomalies brought out in the column in question would soon cease to exist. Boards 12 inches broad by ½ inch thick are given away for next to nothing.

Scantlings, not entered in the preceding list, are charged for as follows :—

	Rs. a. p.	
Beams up to 14 feet long	0 12 0	per cubic foot.
" from 14 to 16 feet long...	0 14 0	"
" " 16 " 18 "	1 0 0	"
" " 18 " 20 "	1 2 0	"
" " 20 " 25 "	1 8 0	"

For beams over 25 feet in length 2 annas extra every foot of length in excess of 25 feet.

From 1882-83 to 1885-86 the following chír trees were cut for timber :—

Girth-class	I.	II.	III.
	730	652	28 = 1,410 trees = 112,680 cubic feet in the round.

This yielded 57,668 cubic feet of sawn timber, being an apparent waste as refuse of about 48 per cent. But as several logs went bad lying out in the rains and some of the trees felled proved to be unfit for sawing, the waste was actually only about 40 per cent.

The system of departmental working was started in 1880, although some preparatory expenditure was incurred in 1879. The revenue and expenditure from the beginning has been as follows :—

Year.	Revenue.	Expenditure.
	Rs.	Rs.
1879-80	...	4,618
1880-81	10,427	8,076
1881-82	10,504	9,111
1882-83	14,129	7,358
1883-84	11,562	5,394
1884-85	10,582	8,781
1885-86	8,059	6,951
Total	65,253	50,289

The preceding figures do not include the cost of the Kahla depôt buildings, which was Rs. 2,300, and part of which is fairly debitable to the expenditure on the timber operations. But even excluding that item, the excess of revenue over expenditure is only Rs. 14,964 for the six years during which 109,845 cubic feet of sawn timber were prepared and sold ; so that the net value of one cubic foot of sawn timber was only 2 annas 2 pies, and of timber in the round hardly 14 pies. If we put on the debit side of the account also share of salaries and travelling allowance of Divisional Officer and office establishment, cost of plant and tools and buildings and roads, the entire balance gets absorbed and a deficit results. Financially, therefore, the departmental timber operations have been a complete failure, owing purely and simply to the extremely low selling rates. No one could have done the work cheaper than it has been done.

Besides purchasers of ready sawn timber there are others who prefer to buy standing trees and effect their conversion themselves. The average number of trees taken by such individuals is given on page 35. The existence of these men is a very great advantage for conservancy and working in that it enables the Department to exploit scattered trees. The trees sold are marked by the Divisional Officer.

The rates for standing chír are as follows :—

Up to 18 inches in girth	4 annas per tree.
Above 18 inches and up to 2′6′ in girth	10 „ „
„ 2′6″ „ 5′ „	3 rupees „
„ 5′ „ 6′ „	5 „ „

For every additional foot or part of foot above 6 feet in girth Rs. 2 extra.

These rates are equivalent to only from 20 pies to 2 annas per cubic foot of sawn timber ; nevertheless, people seem to prefer the convenience of buying ready sawn timber at double, treble, and even quadruple those rates, which proves beyond question the appreciation on the part of the people of departmental working.

As regards the round timber required by graziers for building their sheds, it is charged for according to the size of the shed built—Rs. 2-8-0 for a shed up to 24 × 12 feet, Rs. 3 for one of larger size up to 30 × 15. Wood for repairs is paid for at the rate Rs. 1-8 per shed of whatever size.

Article II.—Fuel.

This subject must be treated under the five following heads :—

(1) Firewood for the troops.
(2) „ right-holders and people living outside the settlement.
(3) „ residents of the settlement.
(4) Charcoal.
(5) Fuel for lime-burning.

Firewood for the troops.—The troops here are convalescents and number on an average about 300. They come up in April and the majority of them—all those who are well enough or not strong enough to stand great cold—go down in November. The number during winter is about 60.

The cutting and exporting of the firewood for these troops is effected entirely by departmental agency under the following agreement:—

"I. An indent shall be sent in to the Forest Officer, Naini Tal Division, during the first half of February in each year, showing the probable monthly requirements during the ensuing official year, in pounds, for Naini Tal, Ránikhet, and Chaubattia separately.

"II. In the event of less or more fuel than that specified by the indent being required, notice must be given two months beforehand; otherwise the Commissariat Department must take over the full amount of their indent.

"III. Green or dry wood of pine or hard woods will be cut up by the Forest Department in lengths not exceeding eighteen inches, and of any girth not less than eight inches, and delivered in the Commissariat fuel depôts at Naini Tal, Ránikhet, and Chaubattia by weighment, if green, one month after cutting.

"IV. Weighments to be made daily when fuel is being carried, and daily receipts given to the Forest Munshi; a monthly receipt in English to be sent to the Forest Officer on the last day of the month for weighments during that month.

"V. Should larger quantities than those specified in the indent for any particular month or months be carried to the Commissariat depôt at Naini Tal, the Commissariat Department agree to take delivery, provided the total amount indented for be not exceeded and subject to the conditions in clause II. The Forest Department will make no allowance for dryage on account of such extra wood.

"VI. Bills will be submitted to the Commissariat Officer, Ránikhet, as soon after the first of the month as possible for fuel delivered during the previous month.

"VII. The rate to be for Naini Tal annas seven and pies six per hundred pounds for all classes of fuel."

The rates for cutting, preparing, and delivering the fuel at the Commissariat godown have been as follows:—

From the China slopes, distance 5¾ miles	...	Rs. 25 per 100lb maunds.
„ Dunikhal, distance 6 miles ...	...	„ 26 „
„ the Hinnan slopes, distance 7½ miles	...	„ 34-6 „

The price received from the Commissariat Department is Rs. 46-14-0 per 100 maunds. It was much less three years ago.

The gross proceeds from and expenditure on these fuel operations since their inception in 1876 and the proportion between income and expenditure are given in the subjoined statement.

Year.	Revenue.	Expenditure.
	Rs.	Rs.
1876-77	5,650	4,544
1877-78	5,181	3,150
1878-79	6,174	3,446
1879-80	14,090	9,570
1880-81	12,781	8,742
1881-82	12,799	7,037
1882-83	12,633	7,717
1883-84	9,654	6,868
1884-85	12,123	8,005
1885-86	9,645	6,384
Total ...	1,00,730	65,463

The figures given for expenditure include only disbursements to workmen and contractors and contains no part of the pay and allowances of establishments, nor of the cost of plant and tools and roads. These are necessarily very variable items, but may be assumed to increase the figures in question by 20 per cent. Putting on this additional cost, we arrive at the following criterion of the financial success or failure of the Commissariat fuel operations for the 10 years during which they have been in progress :—

Revenue.	*Expenditure.*	*Proportion of expenditure to revenue.*	*Net revenue*	100lb *maunds supplied.*	*Average net price per maund.*
Rs.	Rs.		Rs.		
1,00,730	78,000	77 per cent.	22,730	233,000	1 anna. 7 pies.

The result has thus been successful.

Firewood for right-holders and others living outside the settlement.—These people are allowed to collect, free of charge for their own use, dead and fallen wood, except such as has been sold or reserved for a special purpose by the Department. That the right-holders should pay nothing is obvious ; but there is no reason why the rest should not pay a certain small royalty, a commutation fee once for all for the entire season, such as is levied from the far poorer hill tribes of the Central Provinces.

Firewood for residents of the settlement.—The following extract from a printed notice issued by the Divisional Officer will explain the conditions under which the residents of the settlement are supplied :—

" Metal tickets stamped in English and Hindi with the name of the month for which they are available, at eight annas each, will be issued on application to the Divisional Officer. These tickets permit holders to collect and remove any fallen wood from any part of the Naini Tal protected forests, except portions closed for plantation, set aside for villagers or where special fellings are in progress. All such localities will be notified to the recipients of the tickets at the time of issue. Tickets are to be returned to the Naini Tal Forest Office within one week after the commencement of the month following that for which they are available, and an additional fee of one anna per diem may be levied for every day's delay in returning a ticket."

In actual practice dead stumps and dead standing trees marked by the Forest Officer are also taken out. This ticket system was started at the suggestion of General Ramsay on 1st January, 1876, before which time dead and fallen wood could be removed free.

Firewood removed under the authority of these brass tickets may be sold. As only fallen wood is allowed to be removed, the ticket-holders spread out into the forests as far as from five to six miles from the lake. The distance they go of course depend on the proportion between the demand and the supply of such fallen wood ; and if the former were large enough, the entire area of the forests would be visited by them.

The average quantity of firewood removed under a single ticket may be put down at 20 100lb. maunds, value at the ordinary bazar rate Rs. 6-4-0. The quantity would be larger if the tickets were used every day of the month for which it is valid.

The poorer residents fetch their own firewood from the forests or buy it in the bazar from others who do so. The rest employ their servants to bring in the wood.

A point in connection with this last remark is especially noteworthy. The European residents use their jhampánis or dandy-bearers for the purpose. Out of every load brought in by a jhampáni provided with a ticket by his employer he is bound to give the latter 20 seers ; the remainder he sells for his own profit and thus clears at least Rs. 3 a month in addition to his wages. The real effect of this arrangement is of course to reduce the wages payable by the employer, and the Forest

Department thus pays a monthly contribution of Rs. 2-8-0 to the employers for each jhámpani they keep! Up to 1875, when no royalty was levied, this contribution was Rs. 3, and when the levy of a small royalty was suggested, the proposal met with a storm of opposition on the part of the principal residents, and even the chief civil authorities, who prophesied that the imposition of the royalty would result in the settlement being abandoned from inability on the part of the European residents to obtain servants. The municipal committee asked Government to hand over to them the administration of all but the chír area, on the ground that they could manage the forests "at least as well as," and meet the requirements of the station better than, the Forest Department! It was fortunate for the preservation of the forests and the permanence of the settlement that General Ramsay, the permanent Commissioner of Kumaun, came back from leave just in time to suppress the opposition.

(4)—*Charcoal.*

Up to 1880 all the requirements of the settlement were met from these forests. Private individuals burnt the charcoal and paid Government a royalty of 2 annas per maund of 80lb. Up to 1873 green trees were allowed to be felled, but under that régime the forests were rapidly disappearing, and Mr. Braidwood, who then entered upon the charge of the forests, limited the charcoal-burners to dead and fallen wood. By 1879 the stock of such wood was nearly exhausted, and in 1880 a new system was started with the advice and at the suggestion of the Commissioner. In the Bhábar, about 20 miles from Naini Tal, some jungle-covered land was being cleared for cultivation. The Forest Department effected the clearing and converted the felled wood into charcoal, which was brought as far as Jioli in carts, and thence carried up eight miles to the departmental godown at the lower end of the lake, costing, delivered at the godown, 14 annas an 80lb. maund. The Government charcoal was sold at Re. 1 per maund of 80lb.; but in 1881 a private individual, also obtaining his wood from the forests under the civil authorities, started an opposition store and sold his charcoal at 12 annas a maund. This opposition was carried on for about three years, when it collapsed. This failure was followed by the civil authorities opening the fine oak forests on the south face of the Burha Pátal ridge, about eight miles from the settlement, for charcoal-burning, and since 1885 petty dealers, working with Dotial coolies, have brought large quantities of hardwood charcoal, which are hawked about in the bazar. In the face of this continued opposition the departmental arrangements, by which charcoal was obtained from a source 20 miles distant, necessarily fell through, and from the beginning of this year the godown was closed and sold to the municipality.

During the past six years while the Bhábar work has been going on a small quantity of both hardwood and chír charcoal has also been made departmentally in the Naini Tal forests. The respective quantities of charcoal made in the Bhábar and in the Naini Tal forests and sold since 1880 have been as follows :—

Year.	80lb MAUNDS OF CHARCOAL MADE IN		
	Bhábar.	*Naini Tal forests*	
		Hard wood.	Chír.
1880-81	9,360	...	606
1881-82	6,236	...	839
1882-83	5,098	..	488
1883-84	3,289	165	549
1884-85	531	180	125
1885-86	2,419	47	...
Total ...	26,933	392	2,607.

The departmental manufacture and sale of charcoal after a trial of six years has failed. It was bound to fail under any circumstances except that of the departmental possessing a monopoly, for the manufacture of charcoal is a petty industry that can be best done by private agency, and it is a mistake for a State department to become a small retail dealer, especially in a station like Naini Tal, where the population consists mainly of high Government officials and their families, who consider themselves specially privileged to find fault and grumble on every occasion, and who possess the power to render matters unpleasant for the Forest Officer.

(5)—*Fuel for lime-burning.*

Up to 1873 the lime-burners had practically the free run of the forests, and they succeeded in destroying most of the forests on the southern slopes of China and cleared the once very dense forest surrounding Charta village. Some system of working was then introduced and the men could only get trees on special application to the Forest Officer, who marked what he thought the forests could afford. Much of the lime then began to be imported from the foot of the hills near Haldwani. Recently, however, since 1882-83, all the lime required is burnt in the settlement itself with fuel obtained almost entirely within the municipal limits from windfalls, thinnings and clearances for the extension of gardens or building sites. The resources of the municipal forests, if they are to be permanently kept up, cannot go on for ever supplying the necessary amount of fuel, and, as estimated on page 37, we must be prepared to supply about 5,000 maunds of 100lb. annually from the forests of the Naini Tál sub-division.

The price of lime in the settlement is at present 8 annas a maund of 80lb.; when most of the lime came from near Haldwáni the maund sold for from 12 annas to one rupee.

Article III.—Other descriptions of wood.

These constitute a very unimportant item and comprise principally ringáls, garden pegs, and poles up to 12 feet in length and 18 inches in girth.

All those descriptions of produce are sold by means of paper passes issued by the Divisional Officer and entitling the holder to go into the forests and cut and remove the produce himself. The rates of royalty are—

Per coolie-load—about 80 ringals or garden pegs	2 annas
Per pole	4 „

Article IV.—Minor produce.

Fodder-grass is cut and removed free of charge and without any special pass or permit.

Thatching-grass is sold by lease and cut and removed in October-November.

The grazing of cattle belonging to other than right-holders is charged for at the following rates —

Buffaloes	8 annas per head.
Cows, bullocks, and horses and ponies	4 „ „
Sheep and goats	6 pies „

Tar is prepared from old stumps and chips of chír by the purchasers themselves, who pay a royalty of 2 annas per gharra (about 24lb). This is an extremely low rate, and chír tar makes an excellent preservative covering for wood; nevertheless, the quantity exported is insignificant.

No charge is made for the krol limestone; but fresh-water tufaceous and nodular deposits of it found in streams and hollows are removed by the purchasers on payment of a royalty of one anna per cubic foot.

SECTION V.—PAST REVENUE AND EXPENDITURE.

The protected forest.—The revenue and expenditure (Direction charges excluded) since 1872, when these forests came under departmental control, have been as follows:—

Year.	Revenue.	Expenditure.			Net results.	
		A.	B.	Totals.	Surplus.	Deficit.
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
1872-73	1,016	...	...	1,201	...	185
1873-74	1,346	...	...	1,385	...	39
1874-75	1,729	...	...	1,058	671	...
1875-76	5,124	...	...	2,901	2,223	...
1876-77	18,010	6,329	2,164	8,493	9,517	...
1877-78	15,285	...	...	9,648	5,637	...
1878-79	17,155	...	...	8,292	8,863	...
1879-80	21,426	19,125	1,880	21,005	421	...
1880-81	35,782	...	...	43,682	...	7,900
1881-82	33,283	...	...	38,163	...	4,880
1882-83	35,235	23,559	9,180	32,739	2,496	...
1883-84	28,625	16,353	10,704	27,057	1,568	...
1884-85	26,126	...	...	28,971	...	2,845
1885-86	22,499	...	...	27,563	...	5,064
Total ...	2,62,641	...	...	2,52,158	31,396	20,913

As the Divisional Officer has always been in charge of the Conservator's Office, his salary was debited to the Direction Division up to 1879-80. On the other hand, his salary and allowances for 1885-86, although the Ránikhet forests formed half his Division, were entirely debited to the Naini Tal forests.

The aggregate surplus revenue for the 14 years has thus been Rs. 10,483, or Rs. 749 per annum. This is, absolutely speaking, a mere trifle; but considering the small area of the forests, which until last year constituted an entire Division, the large quantity of produce given away free to right-holders and others, and the restrictions placed on the Department as regards rates on the preposterous assumption that, as the forests are managed in the interests of the settlement which consumes all the produce they can yield, no surplus revenue ought to be made, we must congratulate ourselves that a distinct surplus *has* been made. This surplus, however, disappears and becomes a serious deficit if we add a due share of the Direction charges.

The proposed reserved forest.—Data for this forest are not available, as it has hitherto formed an integral portion of a very much larger area under the direct management of the civil authorities.

PART II.

DETAILED DESCRIPTION OF THE FORESTS.

CHAPTER I.—NALENA BLOCK.

Boundaries.—North, the Naini Tál settlement and the Bhalia nadi, separating the block from the Kuria block; east, the Sáth Tál nadi, forming outer boundary of the forest; south, the southern outer boundary of the forest; west, part of the western outer boundary of the forest.

Enclosed private estates.—There are 600 acres of such private estates, distributed into 31 several detached plots: the largest of them measuring nearly 220 acres, the smallest less than one acre.

Area.—3,000 acres, of which 735 unproductive, divided into 24 compartments.

Configuration and aspect.—The southern two-thirds of the block comprise the basin of the Nalena, while the remaining third consists of the northerly and north-easterly slopes forming one side of the basin of the Bhalia nadi. In the Nalena basin, which runs west and east, northerly aspects predominate. Immediately under the great Bhúmi Dhár, which forms a portion of the southern boundary of the block, there is a broad sweep of mostly rounded and open gullies and spurs, and the gradients are fairly uniform and seldom exceed 35°. Elsewhere the ground is very much steeper and broken and scarps and landslips are frequent.

Elevation.—Maximum 6,431 feet, minimum 2,240 feet, mean 4,800 feet.

Soil and underlying rock.—In the greater portion of the Nalena basin, the underlying rock consists of soft, easily-disintegrated Siwálik sandstones with conglomerate in places, and the soil is, therefore, sandy and generally dry and poor, but excellent for chír. In the remainder of the area shales prevail, capped by krol limestone, and the soil, wherever it can accumulate, is deep and rich; and, indeed, the shaly rock itself, wherever it has undergone atmospheric influences to a sufficient extent, is as good as true soil, whence the numerous patches of cultivation holdings in this area.

Stock.—In this block there are four distinct types of forest growth. On the hill at the junction of the Nalena with the Bhalia nadi we find sál and sain forest, together with the mixed forest of inferior species which accompanies sál at the higher elevations, and as usual a belt of chír along the main crest. The forest of inferior species just referred to stretches for some distance along the Bhalia nadi right up to Douglas Dale and extends upwards over the lower slopes. Above this comes oak forest. The sál and accompanying forest and the oak forest are in a very degraded condition from heavy lopping for fodder and manure and from wholesale clearing of the hillsides for charcoal and lime-burning not many years ago. Elsewhere, being the greater portion of the Nalena basin, there is chír forest, which has been heavily felled and now consists of a few old and not always sound or well-shaped trees and a very promising crop of poles, which would have been very much better if the previous fellings, before Mr. Braidwood introduced some system of conservancy, had not been so excessive.

Reproduction in chír and sál forest is generally very good, but is very poor elsewhere owing both to steepness of ground and heavy grazing, as well as to the original degraded condition of the forest growth.

The subjoined statement is a summary of results of the enumeration survey:—

Species.	Diameter-class.	Compartment 1, area 132 acres.		Compartment 2, area 187 acres.		Compartment 3, area 179 acres.		Compartment 4, area 49 acres.		Compartment 5, area 153 acres.	
		Gross number of trees.	Number of trees per acre.	Gross number of trees.	Number of trees per acre.	Gross number of trees.	Number of trees per acre.	Gross number of trees.	Number of trees per acre.	Gross number of trees.	Number of trees per acre.
Chír	I	...	...	24	0·13	81	0·45	18	0·37	12	0·07
	II	...	...	52	0·28	139	0·77	47	0·96	24	0·15
	III	...	...	67	0·35	126	0·70	57	1·16	24	0·15
	IV	...	...	31	0·17	79	0·44	35	0·71	16	0·10
Totals ...	...	...	...	174	0·93	425	2·36	157	3·20	76	0·47
Phanyáth ...	I	...	...	...	...	...	...	...	...	...	...
	II	...	...	...	...	...	...	...	...	...	...
	III	...	...	...	...	...	...	...	...	1	...
	IV	...	...	...	...	...	...	...	...	2	...
Totals ...	...	...	...	...	...	...	...	...	...	3	...
Banj	I	...	...	...	...	...	...	...	...	...	...
	II	...	...	...	...	...	...	1	0·02	...	...
	III	...	...	...	...	...	...	1	0·02	..	...
	IV	...	...	...	...	...	...	3	0·06	...	...
Totals ...	...	...	...	...	...	...	...	5	0·10	...	...
Ayár	I	...	...	...	...	...	...	...	...	...	...
	II	...	...	...	...	...	...	...	...	...	...
	III	...	...	...	...	1	0·01	...	...	...	...
	IV	...	...	...	...	...	...	...	...	...	...
Totals ...	...	...	...	...	...	1	0·01	...	...	...	...
Brons	I	...	...	...	...	...	...	...	...	...	...
	II	...	...	...	...	...	...	...	...	...	...
	III	...	...	...	...	...	...	...	...	...	...
	IV	...	...	...	...	...	...	...	...	...	...
Totals ...	...	...	...	...	...	...	...	...	...	...	...
Sál	I	...	...	50	0·27	33	0·18	2	0·04	8	0·05
	II	...	...	307	1·64	132	0·74	2	0·04	37	0·24
	III	...	...	1,801	9·63	501	2·80	21	0·43	143	0·93
	IV	...	...	8,303	44·40	1,413	7·89	128	2·61	623	4·07
Totals ...	...	...	...	10,461	55·94	2,079	11·61	153	3·12	811	5·24
Sain	I	...	...	59	0·32	22	0·12	...	...	31	0·20
	II	...	...	135	0·72	53	0·30	...	...	103	0·67
	III	...	...	557	2·98	268	1·50	9	0·18	274	1·78
	IV	...	...	1,930	10·32	840	4·69	34	0·69	501	3·27
Totals ...	...	...	...	2,681	14·34	1,183	6·61	43	0·88	909	4·92
GRAND TOTALS ...	...	...	...	13,316	71·15	3,688	20·60	358	7·30	1,799	11·75

Compartment 6, area 49 acres.		Compartment 7, area 44 acres.		Compartment 8, area 86 acres.		Compartment 9, area 68 acres.		Compartment 10, area 45 acres.		Compartment 11, area 56 acres.		Compartment 12, area 156 acres.	
Gross number of trees.	Number of trees per acre.	Gross number of trees	Number of trees per acre.	Gross number of trees.	Number of trees per acre.	Gross number of trees.	Number of trees per acre.	Gross number of trees.	Number of trees per acre.	Gross number of trees.	Number of trees per acre.	Gross number of trees.	Number of trees per acre.
71	1·45	11	0·25	15	0·17	52	0·76	12	0·26	3	0·05	9	0·05
172	3·51	64	1·46	75	0·85	131	1·92	21	0·47	13	0·23	57	0·36
215	4·39	67	1·52	724	8·42	207	3·04	128	2·85	79	1·41	820	5·25
172	3·51	98	2·22	766	8·90	330	4·85	650	14·44	429	7·66	1,829	11·72
630	12·86	240	5·45	1,580	18·34	720	10·57	811	18·02	524	9·35	2,715	17·38
...	...	...	...	...	...	...	...	...	...	8	0·14	1	0·01
...	...	...	...	5	0·06	4	0·06	...	...	11	0·20	6	0·04
...	...	...	...	32	0·36	11	0·16	...	...	42	0·75	49	0·31
...	...	...	...	86	1·00	45	0·66	...	...	133	2·37	94	0·61
...	...	...	...	123	1·43	60	0·88	...	...	194	3·46	150	0·96
...	...	13	0·30	9	0·10	...	...	2	0·04	16	0·29	12	0·08
1	0·02	55	1·25	29	0·34	5	0·07	15	0·33	31	0·55	31	0·19
12	0·24	193	4·39	286	3·33	22	0·32	71	1·58	89	1·59	123	0·79
33	0·68	275	6·25	977	11·36	49	0·72	390	8·67	453	8·09	304	1·95
46	0·94	536	12·19	1,301	15·13	76	1·11	478	10·62	589	10·52	470	3·01
...	...	...	...	...	...	...	...	...	...	1	0·02	3	0·02
...	...	...	...	8	0·09	1	0·02	...	...	5	0·09	19	0·12
...	...	2	0·04	88	1·03	26	0·38	4	0·09	30	0·54	117	0·75
...	...	14	0·32	378	4·39	152	2·23	58	1·29	127	2·27	519	3·33
...	...	16	0·36	474	5·51	179	2·63	62	1·38	163	2·92	658	4.22
...	...	...	...	...	...	...	...	...	...	1	0·02	4	0·03
...	...	...	...	13	0·15	...	...	1	0·02	2	0·04	22	0·15
...	...	3	0·07	153	1·78	1	0·02	1	0·02	33	0·59	189	1·20
...	...	4	0·09	543	6·31	11	0·16	31	0·69	50	0·89	805	5·16
...	...	7	0·16	709	8·24	12	0·18	33	0·73	86	1·54	1,020	6·54
6	0·13	...	...	...	...	...	...	...	...	...	...	...	...
36	0·73	1	0·02	...	...	1	0·02	..	...	...	...	...	...
199	4·06	3	0·07	...	...	30	0·14	...	...	...	...	...	...
522	10·65	1	0·02	1	0·01	145	2·13	1	0·02	...	...	...	...
763	15·57	5	0·11	1	0·01	176	2·29	1	0·02	...	...	...	...
4	0·08	...	...	...	...	1	0·02	3	0·07	...	...	...	...
18	0·37	4	0·09	...	...	1	0·02	...	...	1	0·02	...	...
59	1·22	4	0·09	...	...	10	0·14	3	0·07	5	0·09	...	...
182	3·71	33	0·75	...	...	25	0·37	4	0·09	10	0·18	...	...
263	35·08	41	0·93	...	...	37	0·55	10	0·23	16	0·29	...	...
1,702	61·45	845	19·20	4,188	48·66	1,260	18·21	1,395	31·00	1,572	28·08	5,013	32·11

Species.	Diameter-class.	Compartment 13, area 104 acres.		Compartment 14, area 116 acres.		Compartment 15, area 122 acres.		Compartment 16, area 148 acres.		Compartment 17, area 158 acres.	
		Gross number of trees.	Number of trees per acre.	Gross number of trees.	Number of trees per acre.	Gross number of trees.	Number of trees per acre.	Gross number of trees.	Number of trees per acre.	Gross number of trees.	Number of trees per acre.
Chír ...	I	14	0·13	5	0·04	6	0·05	7	0·05	21	0·13
	II	55	0·53	35	0.30	57	0·47	63	0·42	110	0·69
	III	191	1·84	488	4·21	582	4·77	441	2·98	574	3·63
	IV	1,721	16·55	2,681	23.11	1,803	14·78	1,063	7·19	1,159	7·33
Totals ...	...	1,281	19·05	3,209	27·66	2,448	20·07	1,574	10·64	1,864	11·78
Phanyúth ...	I	9	0·09	9	0·08	16	0·13	17	0·11	16	0·10
	II	23	0·22	33	0.28	29	0·24	28	0·19	60	0·38
	III	39	0·37	133	1·15	87	0·71	114	0·78	158	1·00
	IV	53	0·51	224	1·93	154	1·26	194	1·31	310	1·97
Totals ...	...	124	1·19	399	3.44	286	2·34	353	2·39	544	3·45
Bánj ...	I	15	0·14	14	0·12	21	0·17	17	0·11	41	0·26
	II	39	0·34	33	0.28	39	0·32	32	0·21	74	0·46
	III	70	0·68	146	0·26	87	0·71	142	0·96	154	0·98
	IV	204	1·96	546	4·71	209	1·72	310	2·09	365	2·31
Totals ...	...	325	3·12	739	6·37	356	2·92	501	3·37	634	4·01
Ayár ...	I	...	...	4	0·03	5	0·04	3	0·02	8	0·05
	II	11	0·11	12	0·10	20	0·16	15	0·10	36	0·23
	III	49	0·47	131	1·13	139	1·14	98	0·67	220	1·39
	IV	122	1·17	539	4·65	463	3·79	394	2·67	871	5·51
Totals ..	...	182	1·75	686	5·91	627	5·13	510	3·46	1,135	7·18
Brons ...	I	...	...	5	0·04	22	0·18	6	0·04	17	0·10
	II	17	0·17	35	0·30	72	0·59	49	0·33	97	0·61
	III	50	0·48	244	2·10	385	3·16	267	1·80	392	2·48
	IV	127	1·22	730	6·29	686	5·62	611	4·12	1,400	8·86
Totals ...	...	194	1·85	1,014	8·74	1,165	9·55	933	6·29	1,906	12·05
Sál ...	I	...	...	...	...	...	...	...	...	...	...
	II	...	...	...	...	...	...	...	...	...	...
	III	...	...	...	...	...	...	...	...	...	...
	IV	...	...	...	...	...	...	...	...	...	...
Totals ...	...	...	...	...	...	...	...	...	...	...	...
Sain ...	I	...	...	...	...	...	...	...	...	...	...
	II	...	...	...	...	...	...	...	...	...	...
	III	...	...	...	...	...	...	...	...	...	...
	IV	1	...	...	...	...	...	...	...	...	...
Totals ...	...	1	...	...	...	...	...	...	...	...	...
GRAND TOTALS ...	...	2,807	26·96	6,047	52·12	4,882	40·01	3,871	26·15	6,083	38·47

Compartment 18, area 149 acres.		Compartment 19, area 157 acres.		Compartment 20, area 123 acres.		Compartment 21, area 283 acres.		Compartment 22, area 118 acres.		Compartment 23, area 115 acres.		Compartment 24, area 248 acres.		Entire block area 3,019 acres.	
Gross number of trees.	Number of trees per acre.	Gross number of trees.	Number of trees per acre.	Gross number of trees.	Number of trees per acre.	Gross number of trees.	Number of trees per acre.	Gross number of trees.	Number of trees per acre.	Gross number of trees.	Number of trees per acre.	Gross number of trees.	Number of trees per acre.	Gross number of trees.	Number of trees per acre.
70	0.47	43	0·27	11	0·09	1	0·00	3	0·03	Not surveyed.	...	Not surveyed.	...	489	0·20
313	2·10	130	0·83	26	0·21	5	0·02	7	0.06		...		...	1,596	0·63
648	4.34	263	1·67	29	0·23	13	0·05	10	0·08		...		...	5,753	2·29
534	3·58	1,863	11·87	535	4·34	256	1·07	305	2·58		...		...	16,355	6·51
1,565	10·49	2,299	14·64	601	4·87	275	1·15	325	2·56		...		...	24,193	9·63
...	...	...	...	...	...	...	...	...	...		...		...	76	0·03
...	...	...	...	...	...	...	...	...	...		...		...	199	0·08
...	...	...	...	...	...	...	...	1	0·01		...		...	1,669	0·27
...	...	...	...	...	...	...	...	...	...		...		...	1,295	0·51
...	...	...	...	...	...	...	...	1	0·01		...		...	2,237	0·89
23	0·15	20	0·13	19	0·15	136	0·57	25	0·21		...		...	383	0·16
65	0·43	76	0·48	57	0·46	261	1·09	76	0·64		...		...	917	0·37
147	0·98	129	0·82	200	1·62	597	2·50	212	1·80		...		...	2,681	1·07
244	1·63	402	2·56	310	2·52	1,598	6·70	626	5·31		...		...	7,298	2·90
479	3·19	627	3·99	586	4·75	2,592	10·86	939	7·96		...		...	11,279	4·50
1	0·01	5	0·03	...	...	...	...	..	...		...		...	30	0·01
4	0·02	15	0·09	3	0·02	1	0·00	...	...		...		...	150	0·05
7	0·04	53	0·34	2	0·02	6	0·03	3	0·03		...		...	976	0·32
4	0·02	70	0·45	1	0·01	34	0·14	11	0·09		...		...	3,757	1·24
16	0·10	143	0·91	6	0·05	41	0·17	14	0·12		...		...	4,913	1·63
...	...	17	0·11	...	...	2	0·01	...	...		...		...	74	0·02
1	0·01	51	0·33	3	0·02	6	0·03	...	...		...		...	369	0·12
9	0·06	173	1·10	9	0·07	25	0·10	1	0·01		...		...	1,935	0·64
8	0·05	164	1·04	5	0·04	163	0·68	22	0·19		...		...	5,360	1·78
18	0·12	405	2·58	17	0·13	196	0·83	23	0·20		...		...	7,738	2·56
...	...	...	...	...	...	...	...	...	...		...		...	99	0·03
...	...	...	...	...	...	...	...	...	...		...		...	516	0·20
...	...	...	...	...	...	...	...	...	...		...		...	2,698	1·08
...	...	...	...	...	...	...	...	...	...		...		...	11,137	4·43
...	...	...	...	...	...	...	...	...	...		...		...	14,450	5·75
...	...	...	...	...	...	...	...	...	...		...		...	120	0·0
...	...	...	...	...	...	...	...	...	...		...		...	315	0·12
...	...	...	...	...	...	...	...	...	...		...		...	1,189	0·48
...	...	...	...	...	...	...	...	...	...		...		...	3,559	1·41
...	...	...	...	...	...	...	...	...	...		...		...	5,183	2·06
2,078	13·90	3,474	22·72	1,219	9·80	3,104	13·01	1,302	11·05		...		...	69,094	23·18

Grazing.—The block being so near and accessible, large herds of cattle belonging both to villagers and to the professional graziers, who supply Naini Tál with milk and butter, roam about over all the easier and lower slopes, and especially in broad-leaved forest.

Export lines.—This is one of the most accessible blocks of the forest. The cart as well as the bridle road from Ránibágh traverses it from end to end. A very good bridle-road runs through the middle to Naikána and numerous footpaths intersect the forest in every direction.

Nalena 1.

Boundaries.—North, the Bhalia nadi, separating compartment from Kuria 1; east, the Sáth Tál nadi, forming outer boundary of the forest; south and west, Ránibágh-Naini Tál bridle-road and village lands of Jioli and Kasáni.

Area.—135 acres, of which 70 unproductive.

Configuration and aspect.—Half the aggregate area consists of scarps overhanging the Bhalia and Sáth Tál nadis and a feeder of the latter that runs through the middle of the straggling compartment. The central ground enclosed by these three streams slopes away gradually to the south-east in gradients averaging about 18.°

Elevation.—Maximum 3,000 feet, minimum 2,300 feet, mean 2,750 feet.

Soil and underlying rock.—A very free sandy clay, never deep, resting on sandstones or shales, fragments of both rocks strewing the ground everywhere.

Stock.—With the exception of a little sain near the two large streams, the stock consists essentially of a low scrub of *Bauhinia variegata*, sándhan, and other uncounted species. The density in the central expanse of ground between the three streams is about 0·5. Obviously no enumeration survey has been made.

Grazing.—On the whole, light.

Export lines.—The compartment abuts to the west on the Ránibágh-Naini Tál bridle-road.

Nalena 2.

Boundaries.—North, main watershed ridge separating compartment from Nalena 3; east, village lands of Jioli and abandoned section of Ránibágh-Naini Tál bridle-road; south, the Nalena nadi, forming outer boundary of the forest; west, spur separating compartment from Nalena 5.

Enclosed private land.—A small chak of Jioli, area 3 acres.

Area.—187 acres, of which 30 unproductive.

Configuration and aspect.—With the exception of about 30 acres at its north-eastern corner, which has an easterly aspect, this compartment is situated on the southern slope running down to the Nalena from the Jioli Dhár ridge. The greater portion of the compartment forms a bay corresponding to a bend in the Nalena. The gradients vary from 15° to 40°, but seldom change abruptly, and rapid watercourses, now dry, deeply furrow the mountain side.

Elevation.—Maximum 4,100 feet, minimum 2,400 feet, mean about 3,100 feet.

Soil and underlying rock.—A sandy soil of very variable depth, seldom wanting, mixed with débris of all sizes of the underlying sandstone, which, although occurring in sheet-like masses nearly throughout the scooped-out hollow of the central bay, is generally easy of disintegration. Good soil for sál.

Stock.—The stock, of a mean density of 0·6, consists mostly of sál and sain of all ages, crooked and deformed by former severe lopping, with chír here and there, chiefly along the main ridge. The growth of both sál and sain, under careful conservation, could be fairly vigorous.

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chir... ...	24	2,400	960	52	3,120	1,300	67	1,340	804	31	...	217
Oaks ...	...	...	...	..	...	...	...	...	...	...	...	...
Ayar and brons ...	...	...	...	...	...	...	...	...	...	...	...	...
Sál	50	2,500	2,500	307	9,210	6,140	1,801	18,010	14,408	8,303	16,606	33,212
Sain... ...	59	2,950	3,245	135	4,050	2,700	557	4,456	5,570	1,930	...	11,580
Cypress ...	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	133	7,850	6,705	494	16,380	10,140	2,425	23,806	20,782	10,264	16,606	45,009

Reproduction.—There is not much room for new reproduction, as all gaps are filling up with young sál coppice and seedlings from one to 5 years old.

Grazing.—Not heavy owing to the spare crop of grass.

Export lines.—The old, now abandoned, portion of the Ránibágh-Naini Tál district bridle-road forms the boundary of the compartment at its extreme south-eastern corner.

Nalena 3.

Boundaries.—North and east, village lands of Kasáni, the Ránibágh-Naini Tál bridle-road, and a short line of scarps separating compartment from Nalena 1 and 24; south, main watershed ridge separating it from Nalena 2 and 5; west, prominent spur separating it from Nalena 4.

Area.—179 acres, of which 30 unproductive.

Configuration and aspect—This compartment occupies the broad, deep, northern bay above and on each side of Kasáni, formed by the headwaters of a large feeder of the Sáth Tál nadi. The general fall of the ground is thus to the north, but the main sides of the bay and the numerous small spurs that run out in nearly every direction from the main ridge (Jioli Dhar) form a succession of minor slopes with aspects varying between north-east and west. The gradients are generally very steep, ranging from 26° to 41°, and a few scarps occur.

Elevation.—Maximum 4,450 feet, minimum 2,700 feet, mean about 3,700 feet.

Soil and underlying rock.—A sandy soil, dry, full of boulders, rarely rich or deep, resting on freely-fissured, easily-disintegrating sandstone. There is running water all the year round in the main stream at the bottom of the compartment. Excellent soil for chír, very good for sál.

Stock.—The average density is 0·5, but reaches about 0·9 on the principal spurs. The stock consists of three distinct types as follow: 1*st*, on the lower spurs, most of them formerly under cultivation, sál poles and small trees, nearly pure, heavily lopped, crooked, sickly, and pollard-like: this type occupies about 50 acres; 2*nd*, on the higher spurs, a good growth of chír poles and young trees, nearly pure,

with an occasional sál and a rather large proportion of sain and sandhan: this type covers about 5 acres ; elsewhere (about 94 acres), especially on the main sides of the bay, a scrubby growth of inferior species, with a sprinkling of sain, chír, and sál.

Summary of valuation.

Species.	Class I.			Class II.			Class. III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chir	81	8,100	3,240	139	8,340	3,475	126	2,520	1,512	79	...	553
Oaks	...	...	...	...	...	...	...	...	...	...	...	...
Ayár and brons ...	...	...	...	...	...	...	1	...	6	...	...	...
Sal	33	1,650	1,650	132	3,960	2,640	501	5,010	4,008	1,413	2,826	5,652
Sain	22	1,100	1,210	53	1,590	1,060	268	2,144	2,680	840	...	5,040
Cypress	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	136	10,850	6,100	324	13,890	7,175	896	9,674	8,206	2,332	2,826	11,245

Reproduction.—In the fuller portions there is scarcely any room for new growth to come up. In the more open portions reproduction is backward, except in sál forest, where the co-efficient may be put down at 0·4.

Grazing.—Heavy in all places accessible to cattle, *i e*, more than half the compartment.

Export lines.—The Ránibágh bridle-road forms, for more than a mile, the northern boundary of the compartment about six miles from Naini Tál station.

Nalena 4.

Boundaries.—North, Ránibágh-Naini Tál bridle-road separating compartment from Nalena 24 ; east, prominent spur separating it from Nalena 3 ; south and west, main watershed ridge separating it from Nalena 5 and village lands of Bhaliauti.

Area.—49 acres, of which 10 unproductive.

Configuration and aspect.—This small compartment occupies the deep narrow bay formed by a short much-branched stream which drains the steep minimum gradient 25° (mountain side east of Bhaliauti) northwards into the Bhalia. The ground is extremely rugged and the east side of the bay is almost scarped.

Elevation.—Maximum 4,450 feet, minimum 3,200 feet, mean about 3,800 feet.

Soil and underlying rock—Soil sandy, very variable in depth, though never very deep, containing an appreciable proportion of vegetable mould only along the bottom of the bay, and resting on rather hard but very freely-fissured sandstone, which is often exposed and strews the ground with its fragments ; good for bánj.

Stock.—The density is, on scarped ground, 0·2, elsewhere about 0·6. The crop is composed mainly of soft-wooded inferior species and shrubs and brambles. A few well-grown chir trees fringe the sides of the bay, mixed with some sál, chiefly small poles. About 30 clumps of *Dendrocalamus strictus* skirt the slope at the south-western extremity of the compartment jus above the fields of Bhaliauti.

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chír	18	1,800	720	47	2,820	1,175	57	1,140	684	35	...	245
Oaks	...	...	...	1	...	40	1	...	15	3	...	12
Ayár and brous ...	...	...	...	...	...	...	...	...	...	...	...	...
Sál	2	100	100	2	60	40	21	210	168	128	256	512
Sain	...	...	...	...	...	...	9	72	90	34	...	204
Cypress	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	20	1,900	820	50	2,880	1,255	88	1,422	957	200	256	973

Reproduction.—The gradients are generally too steep or the grazing too heavy for even fair natural reproduction. A few young sál and chír are found here and there.

Grazing.—Very heavy in all places accessible to cattle.

Export lines.—The Ránibágh bridle-road skirts the northern edge of the compartment for about half a mile, five miles below Naini Tál.

Nalena 5.

Boundaries.—North, village lands of Bhaliauti and main watershed ridge separating compartment from Nalena 3 and 4; east, spur separating it from Nalena 4; south and west, village lands of Bhaliauti and Nalena nadi forming outer boundary of the forest as well as separating compartment from Nalena 6.

Enclosed private land.—Matiala Tók, 26 acres.

Area.—154 acres, of which 30 unproductive.

Configuration and aspect.—This compartment occupies the very steep (ruling gradient 36°) often scarped, south-westerly slopes above the Nalena east of Bhaliauti and going right up to the watershed line. It is furrowed by numerous short ravines and gullies running down straight to the Nalena. Terraces of former cultivation still exist everywhere.

Elevation.—Maximum 4,450 feet, minimum 2,600 feet, mean about 3,500 feet.

Soil and underlying rock.—Soil sandy, full of boulders, shallow, resting on rather hard but fairly fissured sandstone which is exposed in a great many places; fair for sál and sain.

Stock.—The average density is about 0·6. The crop is composed chiefly of scrub of inferior species, most of them shrubby. Sál, for the greater part young poles, appears in the eastern half of the compartment and is most abundant on the old cultivation terraces, where its growth is straight and fairly vigorous. Sain, in a very miserable condition owing to former severe lopping and fires, is evenly sprinkled everywhere. Completely canopied masses of *Engelhardtia* are met with on the higher gentle slopes and cultivation terraces.

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chír	12	1,200	480	24	1,440	600	24	480	288	16	...	112
Oaks	...	...	...	...	...	...	1	...	15	2	...	8
Ayár and brons ...	...	...	...	...	...	...	...	...	...	...	...	...
Sál	8	400	400	37	1,110	740	143	1,430	1,144	623	1,246	2 492
Sain	31	1,550	1,705	103	3,090	2,060	274	2,192	0,740	501	...	3,006
Cypress	...	...	...	...	...	...	...	...	...	...	...	..
Total ...	51	3,150	2,585	164	5,640	3,400	442	4,102	4,187	1,142	1,246	5,618

Reproduction.—The mean co-efficient of completeness for the whole compartment is as low as 0·1, in consequence chiefly of the steepness of the slopes. On the cultivation terraces, however, where sál seed-bearers exist and which are little accessible to cattle, it is 0·5.

Grazing.—Heavy over more than half the compartment.

Export lines.—There are no paths or roads inside the compartment. The Ránibágh cart-road runs along the opposite bank of the Nalena near its western extremity, 14 miles along that road from Naini Tál.

Nalena 6.

Boundaries.—North and west, village lands of Rhaupara and a prominent spur separating compartment from Nalena 9 ; east, the Nalena nadi separating it from Nalena 5 ; south, village lands of Dángar, a spur separating compartment from Nalena 7 and outer forest boundary dividing it off from village lands of Chopra outside.

Area.—49 acres, of which 10 unproductive.

Configuration and aspect.—This compartment occupies the easterly and southerly slopes which overlook the Nalena above Chopra. The ruling gradients range from 25° to 30°.

Elevation.—Maximum 4,600 feet, minimum 3,600 feet, mean about 4,000 feet.

Soil and underlying rock.—The soil is a gravelly sand, generally poor and dry, and so shallow as to expose nearly everywhere the underlying freely-fissured, easily-disintegrating sandstone which lies in places in boulders loosely bound together with a little soil.

Stock.—The stock is distributed in very irregular patches of every degree of density and is about equally divided between sál and chír. The forest is generally open (density 0·1 to 0·4), except on some of the steep hollow eastern declivities, on which there is a close growth of sál poles kept in a sickly, crooked, unsound and branchy state by constant lopping and pollarding, and mixed with a fair proportion of sain. The chír, on the other hand, is healthy and vigorous, with fairly tall, clean stems. About half the compartment has once been under cultivation.

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chír	71	7,100	2,840	172	10,320	4,300	225	4,300	2,580	172	...	1,204
Oaks	...	...	...	1	...	40	12	...	180	33	...	132
Ayár and brons ...	...	...	...	...	...	...	...	...	...	...	...	...
Sál	6	300	300	37	1,080	720	199	1,990	1,592	522	1,044	2,088
Sain	4	260	200	18	540	360	59	472	590	182	...	1,072
Cypress	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	81	7,600	3,360	227	11,940	5,420	485	6,762	4,942	909	1,044	4,516

Reproduction.—Very backward, except at the northern end of the compartment, where young chír seedlings are abundant in places, and also on the steeper easterly slopes affected by sál, a few seedlings of which species make a fair show in patches under young coppice of the same tree.

Grazing.—Very heavy and injurious.

Export lines.—The Ránibágh cart-road runs through the eastern end of the compartment for a distance of more than a quarter of a mile—14 miles from Naini Tál.

Nalena 7.

Boundaries.—North, village lands of Rhaupara and Dangar and Nalena 6 ; east and south, outer boundary of forest separating compartment from Commissioner's forest and village lands of Chopra outside ; west, spur separating it from Nalena 8.

Area.—44 acres, of which 10 unproductive.

Configuration and aspect.—This compartment occupies the very steep and rugged easterly slopes below and south of Rhaupara and Dangar. It stretches along the southern boundary of the forest. The gradients run from 30° to scarps. The ground is deeply channelled by the head-waters of two small feeders of the Nalena.

Elevation.—Maximum 5,500 feet, minimum 4,000 feet, mean about 4,800 feet.

Soil and underlying rock.—Soil sandy, shallow, but resting on freely-fissured sandstone which crops out occasionally ; fair for banj ; would be good for chír if the broken nature of the ground were not opposed to the extensive distribution of that species.

Stock.—Where the rock is superficial, the crop consists chiefly of chír with an average density of 0·1 ; elsewhere the density ranges from 0·3 to 0·6, and the stock is mainly composed of bánj mixed with *Engelhardtia*, &c, with chír fringing the crests of the spurs and the main ridge. The forest has been and is still hacked about a great deal, the result being that the bánj cannot rise above a low bushy copse.

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chír... ...	11	1,100	440	64	3,840	1,600	67	13,40	804	98	...	686
Oaks ...	13	...	1,170	55	...	2,200	193	...	2,895	275	...	1,100
Ayar and brons ...	...	...	...	...	...	...	5	...	30	18	...	27
Sál	..	...	...	1	30	20	3	30	24	1	2	4
Sain... ...	...	...	...	4	120	80	4	32	40	33	...	198
Cypress ...	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	24	1,100	1,610	124	3,990	3,900	272	1,402	3,793	425	2	2,015

Reproduction.—The reproduction of chir and bánj in their respective portions may be represented by a co-efficient of 0·2.

Grazing.—Slight.

Export lines.—Nil.

Nalena 8.

Boundaries.—North, village lands of Básgaon and Rhaupara and Nalena 10; east, spur separating compartment from Nalena 7; south, main watershed ridge bounding it from Commissioner's forests; west, prominent spur separating it from Nalena 12.

Area.—86 acres. of which 15 unproductive.

Configuration and aspect.—This compartment occupies the upper northerly slopes of the Nalena valley above Basgáon and Rhaupara right up to the watershed line. The configuration of the ground resembles that of Nalena 11, except that here it is more rugged and the gradients are steeper, rising up to 35.

Elevation.—Maximum 5,300 feet, minimum 4,500 feet, mean about 4,800 feet.

Soil and underlying rock.—As in Nalena 11, but slightly deeper and moister, as it contains a few small springs; excellent for bánj and chír.

Stock.—The stock is remarkably good and averages a density of 0·7. It consists chiefly of bánj in the lower half of the compartment and in the deeper gullies formed by the watercourses in the other half. On the spurs and along the main watershed line that species yields the place to chír, without, however, entirely disappearing. Both the chír and bánj are of vigorous growth. Generally speaking, the crop is quite young, recovering, as it is doing, only now from the effects of previous over-cutting.

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees	Cubic feet of timber.	Maunds of fuel.
Chír ...	15	1,500	600	75	4,500	1,875	724	14,480	8,688	766	...	5,362
Oaks ...	9	...	810	34	...	1,360	318	...	4,770	1,063	...	4,252
Ayar and brons ...	...	...	...	21	...	378	241	...	1,446	921	...	1,381
Sál ...	...	...	...	...	...	...	...	...	...	1	2	4
Sain ...	...	...	...	...	...	...	...	...	...	...	...	...
Cypress ...	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	24	1,500	1,410	130	4,500	3,613	1,283	14,480	41,904	2,751	2	10,999

Reproduction.—There is very little room for new reproduction, the advance growth being sufficient to fill up all gaps.

Grazing.—Owing to the heavy tree-growth, the crop of grass is very spare and the grazing consequently light.

Export lines.—Only steep footpaths.

Nalena 9.

Boundaries.—North, Nalena nadi bounding off compartment from village lands of Bhaliauti; east and south, prominent spur separating it from Nalena 5; west, village lands of Rhaupara and a small sot separating it from Nalena 7.

Enclosed private land.—Andiári chak, 2 acres.

Area.—68 acres, of which 15 unproductive.

Configuration and aspect.—This compartment occupies for the most part the basin of a small watercourse which drains the hillside northwards into the Nalena opposite Andiári. The general aspect is thus northerly, while the sides of the basin and of the spurs between the branches of the watercourse form an alternation of easterly and westerly slopes. The ruling gradients range between 20° and 26°.

Elevation.—Maximum 4,400 feet, minimum 3,800 feet, mean about 4,000 feet.

Soil and underlying rock.—As in Nalena 5.

Stock.—The stock is generally open, the density varying from 0·1 to 0·3. Nearly the whole of the compartment has once been under cultivation. The terraces are all but blank, there being simply a line of trees fringing their edges, and the forest growth is confined principally to the steeper slopes and sharp crest of the ridge. Chír predominates mixed with a little ayár. A few miserable sál, crooked, sickly, and disfigured by lopping and pollarding, occur on eastern aspects and along the crests of some of the spurs, and some bánj and phanyáth are found higher up. The chír is generally of vigorous growth, with straight, tall, healthy-looking stems which can certainly attain a diameter of 2′ 6″. This species has been heavily felled in places within the last three years.

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chír	52	5,200	2,080	131	7,860	3,275	207	4,140	2,484	330	...	2,310
Oaks	...	...	...	9	...	360	33	...	495	94	...	376
Ayár and brons ...	...	...	...	1	...	18	27	...	162	163	...	244
Sál	...	...	...	1	30	20	30	300	240	145	290	580
Sain	1	50	55	1	30	20	10	80	100	25	...	150
Cypress	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	53	5,250	2,135	143	7,920	3,693	307	4,520	3,481	757	290	3,660

Reproduction.—This is, on the whole, very backward, although chír seedlings sometimes make a fair show on one or two northerly slopes and dense patches of sál coppice occur on some easterly aspects.

Grazing.—Very severe : perhaps the sole cause of bad reproduction.

Export lines.—The Ránibágh cart-road runs through its lower end for a distance of more than half a mile.

Nalena 10.

Boundaries.—North, spur separating compartment from Nalena 11, cultivation chak of Nalena and Nalena nadi ; east and south, Nalena 8 and village lands of Rhaupara ; west, Nalena 8 and village lands of Básgáon.

Area.—45 acres, of which 10 unproductive.

Configuration and aspect.—This compartment occupies the bay formed by the lower half of a much-branched stream which drains the slopes above and below

Rhaupara and Básgáon northwards into the Nalena. The gradients are generally steep (30° to 45°). The main aspect is obviously northerly, the sides of the bay looking respectively west and east.

Elevation.—Maximum 4,400 feet, minimum 3,800 feet, mean about 4,100 feet.

Soil and underlying rock.—The soil is a gravelly sand, of fair depth and fertility throughout, freely drained, but with water generally close to the surface. The underlying rock is a freely disintegrating sandstone. Under this is krol limestone, which crops out at the bottom of the compartment and gives rise to springs. Soil excellent for both chír and bánj.

Stock.—Nearly the whole of this compartment was formerly under terrace cultivation. Thanks to the rich moist soil, scrub of inferior species and brambles have taken nearly complete possession of the ground under a generally open growth (density 0·1 to 0·3) of chír and bánj. Sál and sain just put in an appearance here, and climbers, chiefly a large smilax, are very heavy along the moist hollows and trickling rills.

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chír	12	1,200	480	21	1,260	525	128	2,560	1,536	650	...	4,550
Oaks	2	...	180	15	...	600	71	...	1,065	390	...	1,560
Ayár and brons ...	...	...	...	1	...	18	5	...	30	89	...	133
Sál	...	...	...	...	...	...	...	...	...	1	2	4
Sain	3	150	165	...	...	...	3	24	30	4	...	24
Cypress	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	17	1,350	825	37	1,260	1,143	207	2,584	2,661	1,134	2	6,271

Reproduction.—Young bánj coppice occurs in most places to the extent of 0·3. Chír seedlings in small numbers are confined to open ground.

Grazing.—Fairly heavy.

Export lines.—The compartment rests at its southern end on the Ránibágh-Naini Tál cart-road.

Nalena 11.

Boundaries.—North, Nalena nadi, separating compartment from Nalena 23, and village lands of Belwa Khán ; east and south, Nalena 9 and 12 and village lands of Básgáon and Nalena nadi ; west, scarp separating compartment from Nalena 12 and spur separating it from Nalena 13.

Enclosed private land.—A chak of Básgáon, one acre.

Area.—56 acres, of which 10 unproductive.

Configuration and aspect.—The eastern half of the compartment is situated on the rounded slope immediately below Básgáon and rests at the Nalena obliquely against Shálakhot. The other half occupies the deep bay formed in the lower portion of its course by the much-branched stream which drains the slopes north-east and east of Básgáon southwards into the Nalena. The main aspect is thus northerly, with the sides of the bay inclined respectively east and west. The gradients are generally very steep, ranging from 30° to 50°, and the edges of the bay are scarped.

Elevation.—Maximum 4,600 feet, minimum 4,000 feet, mean 4,200 feet.

Soil and underlying rock.—Soil sandy of varying depth, though never deep, resting on freely-creviced, easily-disintegrating sandstone which crops out at points nearly everywhere ; good for chír and bánj.

Stock.—The co-efficient of density is generally 0·6. The forest consists chiefly of bánj and chír poles, associated with a fair proportion of ayár and such other inferior species as *Engelhardtia*, *Phyllanthus*, *nepalensis*, lodh, &c. The chír are tall, straight, and healthy ; but the oaks, although of naturally vigorous growth, are gnarled, stunted, and hollow in consequence of former constant lopping and pollarding.

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chír ...	3	300	120	13	780	325	79	1,580	948	429	...	3,003
Oaks ...	24	...	2,160	42	...	1,680	131	...	1,965	586	...	2,344
Ayár and brons ...	2	...	70	7	...	126	68	...	378	177	...	265
Sál	...	...	...	...	...	...	...	...	...	...	...	...
Sain	...	...	...	1	30	20	5	40	50	10	...	60
Cypress ...	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	29	300	2,350	63	810	2,151	278	1,620	3,341	1,202	...	5,672

Reproduction.—Young low oak coppice, chiefly bánj, is remarkably abundant and evenly distributed, although seedlings of 4 years and under are rare. Pine seedlings are plentiful in patches and there is no place without at least a slight sprinkling of them. The average co-efficient of reproduction may be put down at 0·6.

Grazing.—Heavy.

Export lines.—An old bridle-path, now completely out of repair, traverses the compartment midway between the highest and lowest points.

Nalena 12.

Boundaries.—North and west, spur separating compartment from Nalena 13 and line of scarp separating it from Nalena 11 ; east, Básgáon village lands, spur separating compartment from Nalena 8 ; south, main watershed ridge bounding it off from the Commissioner's forests.

Area.—156 acres, of which 20 unproductive.

Configuration and aspect.—This compartment occupies the upper northerly slopes of the Nalena valley above and south-west of Bá gíon and extends to the watershed line itself. The ground is cut up into a rapid succession of ravines and ridges by the numerous parallel branches of a stream which forms a single channel lower down in Nalena 10. Numerous flat expanses of limited area occur both on the slopes and along the line of watershed. The ruling gradient is 18°.

Elevation.—Maximum 5,300 feet, minimum 4,600 feet, mean about 4,900 feet.

Soil and underlying rock.—Soil sandy, hard (probably due to a calcareous cement), dry, never deep, but seldom wanting, resting on freely-fissured, easily-disintegrating sandstone, boulders of which strew the ground in many places. Excellent soil for mixed chír and bánj.

Stock.—There is an extremely promising young forest of chír, with brons and bánj in the deeper ravines and gullies under the watershed line. Nearly the whole of

this compartment has once been under cultivation, and numerous small patches are still very bare (density 0·0 to 0·2) ; otherwise the density varies from 0·5 to 1·0.

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chír ...	9	900	360	57	3,420	1,425	820	16,400	9,840	1,829	...	12,803
Oaks ...	13	...	1,170	37	...	1,480	172	...	2,580	398	...	1,592
Ayár and brons ...	7	...	245	41	...	738	...	...	...	...	...	...
Sál ...	...	...	...	...	...	...	...	...	...	...	...	...
Sain ...	...	...	...	...	...	...	...	...	...	...	...	...
Cypress ...	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	29	900	1,775	135	3,420	3,043	992	16,400	12,420	2,227	...	14,395

Reproduction.—Dense patches of chír saplings are found everywhere and seedlings and coppice shoots of bánj and brons are abundant in the hollows and ravines The co-efficient of reproduction may be put down at 0·5.

Grazing.—Very heavy.

Export lines.—Nil.

Nalena 13.

Boundaries.—North, the Nalena nadi separating compartment from Nalena 23 ; east and south, portion of a footpath and a prominent spur separating it from Nalena 11 and 12 ; west, prominent spur and lower portion of a sot separating it from Nalena 14.

Area.—104 acres, of which 15 unproductive.

Configuration and aspect.—This compartment occupies the northerly slopes which overhang the Nalena opposite Belwa Khán. It is drained by two or three unimportant raulis and small feeders of the Kalona, against which it rests at its north-west corner. The slopes immediately above the Nalena are very steep, ending at the top in a scarp. Above that is a succession of spurs, knolls, and sloping ledges with easy gradients varying from 5° to 20°.

Elevation.—Maximum 5,000 feet, minimum 4,100 feet, mean about 4,500 feet.

Soil and underlying rock.—As in Nalena 10, but rather drier and not so well suited for bánj.

Stock.—On the steep slopes immediately overhanging the Nalena the ground is naturally ill-covered (density 0·2 to 0·4) with a sprinking of bánj, chír, and phanyáth, except on the rounded slopes at the eastern extremity, where there is also an abundant low growth (density 0·5 to 0·7) of *Machilus odoratissima* and other inferior species. Elsewhere the stock consists of a young forest (density 0·5 to 0·9) of chír chiefly, with a fair proportion of bánj and a goodly sprinkling of brons, ayár, and phanyáth in the glens and deep ravines. The chír forms dense patches of healthy poles and saplings, and the larger trees of that species are tall, straight, and well-grown ; the gentler slopes have all been, not many years ago, under cutilvation.

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chír	14	1,400	560	55	3,300	1,375	191	3,820	2,292	1,721	...	12,047
Oaks... ...	24	...	2,160	59	...	2,360	109	...	1,635	257	...	1,028
Ayár and brons ...	...	...	..	28	...	504	99	...	594	249	...	373
Sál	...	...	...	...	...	...	...	...	...	...		
Sain	...	...	...	...	...	...	...	...	...	...		
Cypress ...	...	...	...	...	...	...	...	...	...	...		
Total ...	38	1,400	2,720	142	3,300	4,239	399	3,820	4,521	2,227	...	13,448

Reproduction.—In the lower portions bánj seedlings and young coppice are abundant in small patches. Elsewhere the co-efficient of reproduction (chiefly chír) may be put down at 0·7.

Grazing.—Heavy.

Export lines.—An old bridle-path going to Naikana and Naini Tál, but now quite out of repair, traverses the lower end of the compartment.

Nlaena 14.

Boundaries.—North, the Nalena nadi separating compartment from Nalena 23; east, portion of a footpath, a prominent spur, and a sot separating it from Nalena 12 and 13; south, main watershed ridge bounding it off from the proposed reserved forest; west, prominent spur separating it from Nalena 15.

Area.—116 acres, of which 20 unproductive.

Configuration and aspect.—This compartment occupies the long, narrow, deep basin of the Kalona stream, which runs down from the main watershed into the Nalena. The centre of the basin falls in terraces which have been used for cultivation. Between the feeders of the main stream some steep spurs rise up, so that, although the general aspect is northerly, some of the minor slopes look also east or west. The gradients are very variable (15° to 38°), and, on the whole, the ground may be said to be rugged.

Elevation.—Maximum 5,430 feet, minimum 4,300 feet, mean about 5,200 feet.

Soil and underlying rock.—Soil sandy, deep, and rich along the middle of the basin, full of springs; gradually decreasing in depth towards the ridges forming the edges of the basin, but always offering a good foothold for trees, thanks to the fissured and easily-disintegrable nature of the underlying sandstone; excellent for chír.

Stock.—Excluding about 20 acres of complete blanks, the result of recent cultivation, the density varies from 0·4 to 1·0, the mean being about 0·8. At the bottom of the compartment and along the main stream, in rich, deep, moist soil, the forest consists chiefly of bánj, phanyáth, and ayár, with utís and other trees of moist and low situations. Elsewhere it is, for the most part, chír of vigorous growth. On the spurs this species becomes nearly pure, banj, brons, and ayár being mixed with it only in small but variable proportions. The whole forest is young and is only just recovering from comparatively recent heavy fellings.

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chír	5	500	200	35	2,100	875	488	9,760	5,856	2,681	...	18,767
Oaks... ...	23	...	2,070	66	...	2,640	279	...	4,185	770	...	3,080
Ayár and brons ...	9	...	315	47	...	846	375	...	2,250	1,269	...	1,903
Sál	...	...	...	...	...	...	...	...	...	...	...	...
Sain	...	...	...	...	...	...	...	...	...	...	...	...
Cypress ...	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	37	500	2,585	148	2,100	4,361	1,142	9,760	12,291	4,720	...	23,750

Reproduction.—In the chír portions saplings and small poles of that species are exceedingly abundant (co-efficient 0·7). In oak forest there is a good deal (0·5) of low bánj coppice, but this is constantly kept back by heavy grazing, which also effectually prevents the blanks from filling up.

Grazing.—Heavy; there is a settlement of graziers just below the main watershed line.

Export lines.—A footpath comes down the whole length of the compartment to meet the footpath along the Nalena.

Nalena 15.

Boundaries.—North the Nalena nadi separating compartment from Nalena 19; east, prominent spur separating it from Nalena 14; south, main watershed ridge bounding it off from proposed reserved forest; west, prominent spur and portion of a sot separating it from Nalena 16.

Area.—122 acres, of which 20 unproductive.

Configuration and aspect.—The ground falls due north from the main watershed ridge to the Nalena. The upper half of the compartment consists of rounded spurs separated by broad depressions, and the gradients there seldom exceed 25°. Lower down, the slopes overhanging the Nalena and the sot that forms part of the western boundary of the compartment, also the sides of the few ravines that alternate with the broad rounded spurs, are very steep and occasionally precipitous. The compartment is completely protected on the north.

Elevation.—Maximum 5,433 feet, minimum 4,300 feet, mean about 4,900 feet.

Soil and underlying rock.—A sandy soil, dry, generally superficial, often exposing the underlying loosely-bedded, freely-creviced sandstone. The pine needles have formed a thin layer of mould at the surface where the action of rain has not been powerful enough to wash it down.

Stock.—Excepting the immediate vicinity of the Nalena, where soft-wooded species, among them some fine alders, form a nearly complete but low and deformed growth, with a few bánj and phanyáth, the stock consists of young chír forest containing about 12 per cent. of brons, 6 of ayár, and 3 of bánj. The average density is approximately 0·6. The chír is vigorous and well-grown. Heavy cuttings of that species were made here a few years ago, and extremely few formed trees of it are now to be met with. Some charcoal was burnt here in 1881. The future of the crop is very promising.

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chír ...	6	600	240	57	3,420	1,425	582	11,640	6,984	1,803	...	12,621
Oaks ...	37	...	3,330	68	...	2,720	174	...	2,610	363	...	1,452
Ayár and brons ...	27	...	945	92	...	1,656	524	...	3,144	1,149	...	1,723
Sál ...	...	...	...	...	...	...	...	...	...	...	...	...
Sain ...	...	...	...	...	...	...	...	...	...	...	...	...
Cypress ...	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	70	600	4,515	217	3,420	5,801	1,280	11,640	12,738	3,315	...	15,796

Reproduction.—Chír seedlings and saplings are abundant, but not to the same extent as in Nalena 15. There is a slight sprinkling of bánj, brons, and ayár coppice clumps everywhere. Co-efficient of completeness, 0·4.

Grazing.—Heavy.

Export lines.—The footpath along the Nalena meeting the old section of the Ránibágh cart-road passes along the bottom of the compartment.

Nalena 16.

Boundaries.—North, the Nalena nadi separating compartment from Nalena 19 ; east, partly a prominent spur and partly a portion of a feeder of the Nalena separating it from Nalena 15 ; south, main watershed ridge bounding it from proposed reserved forest ; west, prominent spur separating it from Nalena 17.

Area.—149 acres, of which 25 unproductive.

Configuration and aspect.—This compartment occupies northerly slopes running down to the Nalena. From the highest point of the main water-shed line the ground falls gently (15° to 25°) for about a quarter of a mile, forming a few broad rounded spurs separated by shallow depressions ; below this the gradients become steep, and in many places, especially just above the Nalena, precipitous, and deep ravines alternate with prominent narrow spurs.

Elevation.—Maximum 5,200 feet, minimum 4,500 feet, mean about 4,900 feet.

Soil and underlying rock.—Soil sandy, generally shallow, dry, resting on loosely and thinly-beded sandstone ; excellent for chír.

Stock.—Along the Nalena there is a very dense (0·7 to 1·0) growth of soft woods, mixed with bánj, phanyáth, and alder. Everywhere else the stock consists of more than 60 per cent. of chír, chiefly poles and young trees. On northerly and north-westerly slopes brons mixed with ayár and with a sprinkling of banj forms the main portion of the underwood. The average density of the crop is about 0·6. Heavy cuttings of chír have taken place in this compartment, for it is evident from the clean straight boles of the standing older trees that the growth was at one time very close. The future of the crop is very promising.

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chír ...	7	700	280	63	3,780	1,575	441	8,820	5,292	1,063	...	7,441
Oaks ...	34	...	3,060	60	...	2,400	256	...	3,840	504	...	2,016
Ayár and brons ...	9	...	315	64	...	1,152	365	...	2,190	1,005	...	1,507
Sál ...	...	...	...	...	...	...	...	...	...	...	...	...
Sain ...	...	...	...	...	...	...	...	...	...	...	...	...
Cypress ...	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	50	700	3,655	187	3,780	5,127	1,062	8,820	11,322	2,572	...	10,964

Reproduction.—Fairly dense thickets of chír saplings are abundant, separated by small blanks in which seedlings have begun to spring up. The average co-efficient of completeness may be put down at 0·6.

Grazing.—Rather heavy.

Export lines.—A footpath runs down the whole length of the compartment to meet the path following the Nalena and joining on to the old section of the Ranibágh cart-road at Belwa Khán.

Nalena 17.

Boundaries.—North, a spur and the upper course of the Nalena nadi separating compartment from Nalena 18 ; east, prominent spur separating it from Nalena 16 ; south and west, main watershed ridge bounding it off from proposed reserved forest.

Area.—159 acres, of which 25 unproductive.

Configuration and aspect.—This compartment occupies the southern half of the bay formed by the head-waters of the Nalena. From the top of the bay the ground falls northwards in gentle slopes until it approaches the Nalena, where the gradients exceed 30° and the depressions forming the channels of the watercourses become more or less deep gullies and ravines.

Elevation.—Maximum 5,200 feet, minimum 4,600 feet, mean about 4,900 feet.

Soil and underlying rock.—Soil sandy, never deep, rather dry, except near the Nalena, overlying loosely-bedded, easily-disintegrating sandstone ; excellent for chír.

Stock.—This is chiefly a chir forest, containing a very large proportion of brons and a good number of ayár. Some phanyáth is found near the Nalena, and a few bánj run up from the Nalena along the ravines and gullies right up to the top. The average density of the stock is about 0·6 Heavy fellings were made here in 1879, and young growth is, therefore, predominant. The vegetation of the chír is excellent, and there is a good future for this compartment.

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chír	21	2,100	840	110	6,600	2,750	574	11,480	6,888	1,159	...	8,113
Oaks ...	57	...	5,130	134	...	5,360	312	...	4,680	675	...	2,700
Ayár and brons ...	25	...	875	133	...	2,394	612	...	3,672	2,271	...	3,406
Sál	..	...	...	...	...	...	...	...	...	...	...	...
Sain	...	...	...	...	...	...	...	...	...	...	...	...
Cypress ...	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	103	2,100	6,845	377	6,600	10,504	1,498	11,480	15,240	4,105	...	14,219

Reproduction.—Seedlings and saplings of chír are abundant and reproduction is generally very active in spite of the grazing. The average co-efficient of completeness is 0 6.

Grazing.—Heavy.

Export lines.—A footpath cuts across the western extremity of the compartment into Nalena 17 and another traverses its northern end.

Nalena 18.

Boundaries.—North, prominent ridge separating compartment from Nalena 19 and from the late Iron Company's grant; east, spur separating it from Nalena 19; south, spur and extreme upper course of Nalena nadi separating it from Nalena 17, and cultivation chak of Arukhán; west, main watershed ridge dividing it off from the proposed reserved forest.

Area.—150 acres, of which 30 unproductive.

Configuration and aspect.—This compartment occupies the slopes which contain the northern half of the head-waters of the Nalena nadi. Generally speaking, the western fourth of the compartment has an easterly aspect, while the remaining portion looks south. The gradients are everywhere very steep, seldom falling below 30° and often running up into scarps.

Elevation.—Maximum 5,600 feet, minimum 4,600 feet, mean about 5,100 feet.

Soil and underlying rock.—A sandy soil, calcareous, of very variable depth according to the steepness of the slopes, dry, generally mixed with débris of the underlying krol limestone and loosely-bedded sandstone; excellent soil for chír.

Stock.—With the exception of strips of mixed bánj filling up the ravines and gullies (average density 0·5), the stock consists chiefly of chír forest (density 0·4), which, although kept back and injured by fires and resin-tappers, are tall and straight. Fellings were made here in 1879, the result being that the standing mature chír are nearly all unsound rejected trees.

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chír ...	70	7,000	2,800	313	18,780	7,825	648	12,960	6,576	534	...	3,738
Oaks ...	23	...	2,070	65	...	2,600	147	...	2,205	244	...	976
Ayár and brons ...	1	...	35	5	...	90	16	...	96	12	...	18
Sál ...	...	...	...	...	...	...	...	...	...	...	...	...
Sain ...	...	...	...	...	...	...	...	...	...	...	..	...
Cypress ...	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	94	7,000	4,905	383	18,780	10,515	811	12,960	8,877	790	...	4,732

Reproduction.—Seedlings and saplings of chír are fairly abundant (average co-efficient 0·5) everywhere except in the mixed bánj forest, where reproduction is very backward (co-efficient 0·2).

Grazing.—Slight.

Export lines.—A footpath, ultimately meeting the Naikána-Naini Tál bridle-path, intersects the western extremity of the compartment from south to north, while another footpath starting from the former runs along the Nalena towards the old section of the Ránibágh cart-road.

Nalena 19.

Boundaries.—North, spur and portion of Naikána-gád separating compartment from Nalena 20 and village lands of Naikána ; east, Naikána gadhera separating it from Nalena 23 ; south, the Nalena nadi separating it from Nalena 15 and 16 ; west, two spurs separating it from Nalena 18 and main watershed ridge bounding it off from proposed reserved forest.

Enclosed private land.—Balni Khán, 8 acres.

Area.—157 acres, of which 25 unproductive.

Configuration and aspect.—The northern portion of the compartment (about three-sevenths of the total area) is situated on northerly slopes of more or less uniform gradients (25° to 30°) running down to the Naikána gadhera. Of the remaining four sevenths, one-fourth at the eastern extremity consists of very steep slopes (from 35° to scarps) also overhanging the Naikána gadhera, while three-fourths descend almost due south to the Nalena, beginning with scarps and ending in gradients of about 30°. The spurs are broad and rounded throughout the compartment.

Elevation.—Maximum 6,000 feet, minimum 4,340 feet, mean about 5,000 feet.

Soil and underlying rock.—Sandy, calcareous and silicious, generally dry, never deep, often superficial, overlying chiefly krol limestone and only partially shales, fragments of both rocks being mixed up with it or strewing the surface ; excellent for chír.

Stock.—Chír is everywhere predominant. On the southerly slopes it forms pure forest more than half way up the hillside, where a little bánj with a large proportion of inferior species enters into the crop. The average density on these slopes is about 0·3, and the trees are tall and vigorous, but many have suffered from

tapping for resin and from fires. The northern slopes, excepting a few small blanks, the sites of former cultivation, are almost completely covered with young chír forest, sprinkled to a fair extent with young bánj and brons. The eastern slopes are poorly stocked (density 0·2 to 0·5), chiefly with inferior species, such as *Phœbe*, *Bauhinia*, &c. A few sain trees are found in the lower portion of the compartment near the Nalena. The ridge forming the watershed between the Nalena and Naikána gadhera is almost quite blank. The growth of chír is everwhere vigorous and promising.

Summary of valuation.

Species.	Class I.			Class. II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chir ...	43	4,300	1,720	130	7,800	3,250	263	5,260	2,916	1,863	...	13,041
Oaks ...	20	...	1,800	76	...	3,040	129	...	1,935	402	...	1,608
Ayár and brons ...	22	...	770	66	...	1,188	226	...	1,356	234	...	351
Sál ...	...	...	...	...	...	...	...	...	...	...	...	...
Sain ...	...	...	...	...	...	...	...	...	...	...	...	—
Cypress ...	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	85	4,300	4,290	272	7,800	7,478	618	5,260	6,207	2,499	...	15,000

Reproduction.—Uncounted poles and saplings of chír and bánj and of brons are abundant on the northern slopes, where the blanks are filling up fast with chír (coefficient of density 0·4 to 0·6). On the southern slopes the presence of bánj and brons with low bushy crowns interferes with the reproduction of chír, seedlings of which occur to the extent of 0·4 to 0·5 in the more open places. On the eastern slopes the reproduction is very backward, owing chiefly to the steepness of the ground.

Grazing.—Slight.

Export lines.—A fairly good footpath going to Naini Tál *viâ* Naikána flanks the southern and eastern boundaries of the compartment.

Nalena 20.

Boundaries.—North and east, prominent spur separating compartment from Nalena 21 and 22 ; south, village lands of Naikána and portion of Naikána gadhera and spur separating compartment from Nalena 19 ; west, main watershed line separating it from proposed reserved forest.

Enclosed private lands.—

Sakniáni	chak 1	...	...	...	...	2 acres.
Ditto	ditto 2	...	...	...	...	1 acre.
Ditto	ditto 3	...	...	...	...	2 acres.
Aláni	ditto 4	...	...	...	...	2 "

Area.—124 acres, of which 20 unproductive.

Configuration and aspect.—This compartment occupies the southerly slopes which are drained by the northern head-waters of the Naikána gadhera. The lines of the crests of the spurs form angles of from 20° to 30° with the horizontal ; but all the remaining slopes are very steep, the gradients ranging from 35° to 50°. The whole compartment is protected on the west by the lofty ridge forming its western boundary.

Elevation.—Maximum 6,400 feet, minimum 5,200 feet, mean about 5,700 feet.

Soil and underlying rock.—As in compartment 18.

Stock.—The stock is extremely poor, the average density being only 0·1. There is everywhere a sprinkling of miserable bánj, chiefly of small girth; but sound young chír, often growing in small clumps, occur on the crests of spurs and ridges.

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chír ...	11	1,100	440	26	1,560	650	29	580	348	535	...	3,745
Oaks ...	19	...	1,710	57	...	2,280	200	...	3,000	310	...	1,240
Ayár and brons ...	...	...	...	6	...	108	11	...	66	6	...	9
Sál ...	...	...	...	...	...	...	...	...	...	...	...	...
Sain ...	...	...	...	...	...	...	...	...	...	...	...	...
Cypress ...	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	30	1,100	2,150	89	1,560	3,038	240	580	3,414	851	...	4,994

Reproduction.—The reproduction may be represented by a co-efficient of 0·2. Recent seedlings of bánj are conspicuously rare.

Grazing.—Very heavy, large herds of cows and buffaloes, belonging both to villagers and professional gaulis, roam over the hillsides daily for more than half the year.

Export lines.—Two footpaths going direct to Naini Tál, one cutting off the northern extremity of the compartment, the other traversing its middle.

Nalena 21.

Boundaries.—North, Naini Tál settlement; east, lands belonging to Brewery and village of Talla Charta and part of old Ránibágh-Naini Tál cart-road separating compartment from Nalena 24; south, prominent spur and lower portion of a set separating it from Nalena 20 and 22; west, prominent ridge separating it from proposed reserved forest.

Enclosed private lands.—

Deota 1	1	acre.
Deota 2	2	acres.
Manora	9	"
Malla Charta	14	"
Talla Charta	12	"

Area.—239 acres, of which 40 unproductive.

Configuration and aspect.—With the exception of 50 acres west of the Deota cultivation chaks, which have a north-easterly aspect and are drained into a feeder of the Bhalia, the compartment consists of easterly slopes drained directly into the Bhalia and forming a broad bay with very steep (gradients 35° to 50°) sides and cut up into numerous ravines and broad spurs. Except at the highest portion of the compartment and near the present cultivation chaks, the gradients seldom fall below 25°.

Elevation.—Maximum 6,481 feet, minimum 4,700 feet, mean about 5,500 feet.

Soil and underlying rock.—A sandy soil; in the higher portions of the compartment and at its north-east corner of fair depth, and in the latter place full of vegetable mould; otherwise superficial, covered with débris of all sizes of the underlying soft shale, which is inclined to slip in places; excellent for bánj and, at the top, for chír also.

Stock.—At the northern extremity and along the upper portions of the compartment there is a dense (0·7 to 1·0) belt of bánj mixed with brons, ayár, and other inferior species. The trees all show great vigour, but are crooked, deformed, and more or less stunted, owing to lopping and other maltreatment. A few small glades occur here and there. At the southern end of this belt appears a patch of chír poles averaging a density of about 0·5, but much injured by lopping. Elsewhere the slopes are very bare, being either dotted with solitary trees and small clumps of bánj and a few chír or showing patches of inferior species, such as *Bauhinias and Engelhardtias*, mixed with scanty brushwood, comprising chiefly brambles, barberry, &c. A large portion of this compartment has been formerly under cultivation, and nearly all the slopes were cleared by lime-burners about 12 years ago. Since then the proximity of cultivation and human dwellings and heavy grazing have effectually prevented the forest from recovering.

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chír ...	1	100	40	5	300	125	13	260	156	256	...	1,792
Oaks ...	136	...	12,240	261	...	10,440	597	...	8,955	1,598	...	6,392
Ayár and brons ...	2	...	70	7	...	126	31	...	186	197	...	295
Sál ...	...	...	...	...	...	...	...	...	...	...	...	...
Sain ...	...	...	...	...	...	...	...	...	...	...	...	...
Cypress ...	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	139	100	13,350	273	300	10,691	641	260	9,297	2,051	...	8,479

Reproduction.—In the better stocked portion of the compartment low bánj coppice is abundant in places. With this exception, reproduction, especially in the shape of new seedlings, is extremely backward, the mean co-efficient being under 0·2, and, in spite of the excellent free soil, it can never come to much as long as grazing and lopping are unrestricted.

Grazing.—Very heavy ; large herds of buffaloes and cows belonging to professional gaulis as well as villagers roam over the hillsides during the greater part of the year.

Export lines.—The old and new sections of the Ránibágh-Naini Tál cart-road run along the eastern boundary of the compartment, and the old bridle-path, now disused and out of repair, from Naikána to Naini Tál traverses the compartment midway between its highest and lowest points. A good footpath also runs parallel to the ridge and crossing its eastern boundary.

Nalena 22.

Boundaries.—North, spur and deep narrow ravine separating compartment from Nalena 21 ; east, old section of Ránibágh-Naini Tál cart-road and small spur separating it from Nalena 24 ; south, a small isolated chak of Naikána village and Nalena 23 ; west, village lands of Naikána and Gádo Malla and prominent spur separating compartment from Nalena 20.

Enclosed private lands—.

Deoldhúnga	11 acres.
Gádo Talla	6 „

Area.—118 acres, of which 25 unproductive.

Configuration and aspect.—This compartment occupies steep (gradients generally ranging between 30° and 50°), rugged, irregular slopes drained eastwards directly into the Bhalia nadi.

Elevation.—Maximum 6,050 feet, minimum 4,500 feet, mean about 5,100 feet.

Soil and underlying rock.—A sandy soil, generally shallow, but for the most part overlying soft shales. Masses of the krol limestone crop out in the middle and the top of the compartment. Good soil for bánj.

Stock.—The lower slopes bear a spare scrub of inferior species interrupted by numerous blanks. Above this appears bánj forest with an average density of about 0·3 and suffering from past and present maltreatment. The spur forming the western boundary of the compartment is fringed with small badly-grown chír.

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chír	3	300	120	7	420	175	16	200	120	305	...	2,135
Oaks ...	25	...	2,250	76	...	3,040	213	...	3,195	626	...	2,504
Ayár and brens ...	...	...	...	...	...	...	4	...	24	33	...	49
Sál	...	...	...	...	...	...	...	...	...	...	...	...
Sain	...	...	...	...	...	...	...	...	...	...	...	
Cypress ...	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	28	300	2,370	83	420	3,215	227	200	3,339	964	...	4,688

Reproduction.—On the lower slopes advance growth of tree species is almost, *nil.* In the bánj patch the co-efficient may be set down at 0·2 and in the chír belt at 0·3. The reproduction would be excellent but for the heavy grazing and the proximity of cultivation.

Grazing.—As in Nalena 20.

Export lines.—The old section of the Ránibágh cart-road forms the eastern boundary of the compartment for about a mile below the Brewery, while the old disused bridle-path from Naikána to Naini Tál cuts through its uppermost corner.

Nalena 23.

Boundaries.—North, village lands of Naikána and Nalena 22; east, Nalena 24 and village lands of Belwa Khán; south, Nalena nadi separating compartment from Nalena 11, 13, and 14; west, Naikána gadhera separating it from Nalena 19.

Area.—116 acres, of which 30 unproductive.

Configuration and aspect.—With the exception of 11 acres at the eastern extremity, which fall westwards towards the Naikána gadhera, the compartment occupies the southerly slopes which descend from Naikána and Belwa Khán to the Nalena. The slopes are furrowed by numerous small but deep gullies and are everywhere very steep and even scarped, the gradient seldom being less than 30°. Small landslips have recently occurred.

Elevation.—Maximum 5,200 feet, minimum 4,100 feet, mean about 4,700 feet.

Soil and underlying rock.—A sandy soil, dry, never deep, often exposing the underlying shales and krol limestone, fragments of which rocks, especially the former, strew the ground everywhere; good for chír.

Stock.—The crop here has probably been a good one, but has been ruined by neighbouring cultivation, heavy grazing, and destructive fellings, due to its accessibility. What remains of the chír along the spurs and ridges of the compartment is of very fair growth, the trees being tall and straight. A few degraded clumps of bánj appear at the south-west corner, and sain puts in an appearance near the Nalena. The rest of the stock consists of *Bauhinia, Phœbe,* &c., with much brushwood. The average density of the tree-growth may be put down at 0·4.

Summary of valuation.—No enumeration survey has been made.

Reproduction.—In and around the chír portions seedlings of that species are abundant and may be represented by a co-efficient of 0·5, and will no doubt spread under favourable circumstances. Elsewhere there is a uniform, but not promising, sprinkling of young coppice clumps of uncounted species.

Grazing.—Very heavy, chiefly of village cattle.

Export lines.—A fairly good footpath, abutting on the old section of the Ránibágh cart-road, runs through the southern portion of the compartment from end to end.

Nalena 24.

Area.—237 acres, of which 200 unproductive. This is an extremely irregular and straggling compartment, extending for nearly three miles, as the crow flies, along the right bank of the Bhalia from about a quarter of a mile above the Brewery down to the village of Kasáni. It includes all the blank or scrub-covered scarps and steep slopes which overhang or are traversed by the Ránibágh-Naini Tál cart and bridle-roads, or which form narrow tongues of Government forest running between village lands. Under the most favourable circumstances work can never be done here, and the chief, perhaps the only, reason for keeping this area under the Forest Department is to preserve the roads already mentioned and the bank of the Bhalia.

CHAPTER II.—KURIA BLOCK.

Boundaries.—North, the Naini Tál cantonment, the Laria Kánta and Bhawali blocks, and the village lands of Bhungárh and Aksára; east, the village lands of Tircha Khet and the bridle-road from Tircha Khet to Jioli, forming part of the eastern outer boundary of the forest; south and west, the Bhalia nadi, separating the block from the Nalena block and from the Naini Tál settlement.

Enclosed private estates.—Fourteen several blocks or plots aggregating nearly 500 acres, the largest comprising 146 acres and the smallest 2 acres.

Area.—2,337 acres, of which 695 unproductive, divided into 13 compartments.

Configuration and aspect.—This block extends along the steep, south-westerly slopes forming the left side of the immediate basin of the Bhalia nadi, and crossing thence the watershed line stretches over the entire broad deep and very rugged basin of the Kuria gád, which drains the slopes below the Kale Khán ridge south-eastwards into the Bhalia. In the basin of the Kuria gád scarps abound.

Elevation.—Maximum 6,022 feet, minimum 2,620 feet, mean 4,400 feet.

Soil and underlying rock.—In the greater portion of the area the uppermost rock consists of loose shales, the underlying sandstone, which is often quartzitic, appearing principally in the lower part of the block between the Tircha Khet and the Sáth Tál nadi. The hillsides are extremely fissured and liable to slip. In the shaly portion it is evident that soil for tree-growth is never wanting and is often deep and rich. Even in the sandstone area there is generally always some soil, except on the numerous scarps, some of which are the result of recent landslips. The larger watercourses flow all the year round.

Stock.—This is the worst stocked block of the forest, heavy and uncontrolled grazing, merciless lopping for fodder and manure, ruthless overfelling, and frequent landslips having brought the forest growth to the verge of ruin. Some good patches of oak exist below Gethia and a few promising but open belts of chír crown the highest ridges or run down the slopes coming down from the ridge above Tircha Khet. Otherwise we meet either with blanks or with scrub of inferior species or a few narrow bands of mutilated sál. In the few patches of banj and bands of sál the reproduction is fairly abundant; elsewhere it is extremely backward.

The subjoined statement summarizes the results of the enumeration survey :—

Species.	Diameter-class.	Compartment 1, area 176 acres.		Compartment 2, area 71 acres.		Compartment 3, area 39 acres.		Compartment 4, area 354 acres.		Compartment 5, area 198 acres.		Compartment 6, area 191 acres.	
		Gross number of trees.	Number of trees per acre.	Gross number of trees.	Number of trees per acre.	Gross number of trees.	Number of trees per acre.	Gross number of trees.	Number of trees per acre.	Gross number of trees.	Number of trees per acre.	Gross number of trees.	Number of trees per acre.
Chír ...	I	...	...	4	0·06	1	0·03	...	...	...	...	...	...
	II	...	...	9	0·12	6	0·15	...	...	...	...	...	...
	III	8	0·04	15	0·21	4	0·10	...	...	...	...	...	...
	IV	14	0·07	22	0·31	17	0·44	...	...	...	...	...	...
Totals ...		22	0·11	50	0·70	28	0·72	...	...	...	...	...	...
Bánj ...	I	...	...	...	...	...	...	...	...	...	...	...	...
	II	...	...	...	...	...	...	...	...	...	...	...	...
	III	...	...	...	...	...	...	...	...	...	...	...	...
	IV	...	...	...	...	...	...	...	...	...	...	...	...
Totals ...		...	...	...	...	...	...	...	...	...	...	...	...
Ayár ...	I	...	...	...	...	...	...	...	...	...	...	...	...
	II	...	...	...	...	...	...	...	...	...	...	...	...
	III	...	...	...	...	...	...	...	...	...	...	...	...
	IV	...	...	...	...	...	...	...	...	...	...	...	...
Totals ...		...	...	...	...	...	...	...	...	...	...	...	...
Sál ...	I	2	0·01	20	0·28	1	0·03	...	...	...	...	...	...
	II	5	0·03	48	0·68	1	0·03	...	...	...	...	...	...
	III	15	0·08	174	2·45	9	0·23	...	...	...	...	...	...
	IV	91	0·46	471	6·63	25	0·64	...	...	...	...	...	...
Totals ...		113	0·58	713	10·04	36	0·92	...	...	..	..	...	...
Sain ...	I	2	0·01	5	0·07	1	0·03	...	...	...	...	...	...
	II	22	0·11	6	0·08	6	0·15	...	...	...	...	...	...
	III	149	0·76	39	0·55	26	0·67	...	...	...	...	...	...
	IV	240	1·22	82	1·15	69	1·77	...	...	...	...	...	...
Totals ...		413	2·10	132	1·86	102	2·62	...	...	...	...	...	...
GRAND TOTALS ...		...	...	...	...	...	...	...	...	...	...	...	...

Compartment 7, area 146 acres.		Compartment 8, area 92 acres.		Compartment 9, area 191 acres.		Compartment 10, area 118 acres.		Compartment 11, area 246 acres.		Compartment 12, area 70 acres.		Compartment 13, area 293 acres.		Entire block, area 2,337 acres.	
Gross number of trees.	Number of trees per acre.	Gross number of trees.	Number of trees per acre.	Gross number of trees.	Number of trees per acre.	Gross number of trees.	Number of trees per acre.	Gross number of trees.	Number of trees per acre.	Gross number of trees.	Number of trees per acre.	Gross number of trees.	Number of trees per acre.	Gross number of trees.	Number of trees per acre.
4	0·03	...	...	30	0·16	14	0·12	...	...	...	...	...	...	53	0·02
16	0·11	...	...	70	0·37	55	0·47	...	...	...	...	...	...	156	0·06
14	0·10	...	...	74	0·39	89	0·75	...	...	...	...	...	...	204	0·09
15	0·10	...	...	27	0·14	120	1·02	...	...	...	...	...	...	215	0·10
49	0·34	...	...	201	1·06	278	2·36	...	...	...	...	...	...	628	0·28
4	0.03	27	0.29	15	0·08	1	0·01	...	...	...	...	...	...	47	0·02
5	0·03	84	0·91	38	0·20	...	0·00	...	...	...	...	...	...	127	0·05
24	0·16	252	2·74	74	0·39	1	0·01	...	...	...	...	...	...	351	0·15
133	0·91	902	9·80	71	0·37	...	0·00	...	...	...	...	...	...	1,106	0·48
166	1·13	1,265	13·75	198	1·04	2	0·02	...	...	...	...	...	...	1,631	0·70
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	3	0·03	...	...	...	...	...	...	...	...	...	...	3	...
...	...	3	0·03	...	...	...	...	...	...	...	...	...	...	3	...
...	...	...	...	...	...	11	0·09	...	...	...	...	...	...	34	0·01
...	...	...	...	...	...	27	0·23	...	...	...	...	...	...	81	0·03
...	...	...	...	...	...	49	0·42	...	...	...	...	...	...	247	0·10
...	...	...	...	...	...	98	0·83	...	...	...	...	...	...	685	0·30
...	...	...	...	...	...	185	1·57	...	...	...	...	...	...	1,047	0·44
...	...	...	...	...	...	...	...	...	...	...	...	...	...	8	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...	34	0·01
...	...	...	...	...	...	...	...	...	...	...	...	...	...	214	0·09
...	...	...	...	...	...	...	...	...	...	...	...	...	...	391	0·17
...	...	...	...	...	...	...	...	...	...	...	...	...	...	647	0·27
...	...	...	...	...	...	...	...	...	...	...	...	...	...	3,956	1·68

Grazing.—Excessively heavy everywhere, most of the cattle for the milk-supply of the station and cantonment being located within this area.

Export lines.—The upper portion of the block immediately below the cantonment is well provided with a cart-road and many easy footpaths. All the lower portion of the area is not easily accessible, but this is no drawback for the present, since there is hardly anything there to export.

Kuria 1.

Boundaries.—North, main watershed ridge separating compartment from Kuria 10 ; east, Jioli-Shám Khet bridle-path forming outer boundary of the forest ; south, Bhalia nadi separating compartment from Nalena 1 and 24 ; west, spur separating it from Kuria 2.

Area.—190 acres, of which 40 unproductive.

Configuration and aspect.—This compartment is situated in the angle formed by the junction of the Kuria gád with the Bhalia nadi. The slopes that are drained into the former stream (about 50 acres) look nearly due east, while those that run down to the Bhalia have a southerly aspect. The ground from the main ridge down to one-third the width of the compartment, and a little less than another third along the Bhalia, is very steep (35° to 50°) and rugged, the middle ground forming a zone of gentle slopes (5° to 20°). This last contains some hollows which form natural tanks that are dry for about four months in the year. The whole compartment is exposed to the full brunt of the south-east winds which bring up the monsoon from the Bay of Bengal.

Elevation.—Maximum 4,200 feet, minimum 2,600 feet, mean about 3,300 feet.

Soil and underlying rock.—Silicious, generally dry, never deep, often superficial and strewn with fragments of the underlying rock—sandstones, passing into quartzite in the upper half of the compartment and shales below. Fairly good soil for sál and sain.

Stock.—The average density of the stock is about 0·4. It consists chiefly of scrubby growth of *Bauhinia variegata*, sándhan, and other uncounted species, with a little sain on the steep slopes immediately overhanging the Bhalia and a few sál and chír near the main ridge. The sál is lopped every year for covering turmeric fields and its appearance is pitiable in the extreme, while the chír is stunted and branchy. There is promise for this compartment only in a very remote future.

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chír ...	...	...	...	...	...	...	8	160	96	14	...	98
Oaks ...	...	...	...	...	...	...	...	...	...	...	...	...
Ayár and brons ...	...	...	...	...	...	...	...	...	...	...	...	...
Sál ...	2	100	100	5	150	100	15	150	120	91	182	364
Sain ...	2	100	110	22	660	440	149	1,192	1,490	240	...	1,440
Cypress ...	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	4	200	210	27	810	540	172	1,502	1,706	345	182	1,902

Reproduction.—The reproduction of sál, sain, and chír is next to nothing, and that of the scrubby, uncounted species scarcely averages 0·1. The gentler slopes are grazed over ; and the steepness and bareness of two-thirds of the compartment and the exposed situation of the whole area are extremely unfavourable to the production of seedlings.

Grazing.—Heavy in all easily accessible portions (more than one-third of the compartment).

Export lines.—The Jioli-Shám Khet district bridle-road, as stated above, forms the eastern boundary of the compartment, and an excellent footpath traverses the zone of gentler slopes, parallel to the Bhalia, connecting the bridle-road with the Ránibágh-Naini Tál cart-road at Gethia and at the Brewery.

Kuria 2.

Boundaries. - North, main watershed ridge separating compartment from Kuria 9 and 10; east, prominent spur separating it from Kuria 1; south, village lands of Saria Tál; west, prominent spur separating compartment from Kuria 3.

Area.—71 acres, of which 15 unproductive.

Configuration and aspect.—The eastern three-fourths of this compartment consist of the long narrow, but shallow, bay formed by a much-branched stream which feeds the small tál situated east of the Saria Tál village. The slopes, which have nearly all a southerly aspect, are everywhere very steep (average gradient 35°) and are often scarped, especially in the southern half of the area. The ground falls 1,300 feet in a little more than half a mile.

Elevation.—Maximum 4,800 feet, minimum 3,500 feet, mean about 4,100 feet.

Soil and underlying rock.—Soil silicious, superficial, often absent, especially on the spurs, mixed with fragments of all sizes of the underlying rocks, shale below and sandstone passing into quartzite above.

Stock.—Stunted chír fringes (density 0·2) the ridge at the top of the compartment, and sál, severely lopped and in a most unsightly condition, forms the greater portion of the stock on the main spurs, where the average density is about 0·5. A few sain are scattered throughout the lower half of the compartment. Otherwise the crop is composed of scrubby koiral, sándhan, and other inferior species, hugging chiefly the ravines and gullies. The average density for the whole compartment may be put down at 0·3. The future of this compartment will for a long time be a miserable one.

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chír ...	4	400	160	9	540	225	15	300	180	22	...	154
Oaks ...	...	...	...	...	...	...	...	...	...	...	...	...
Ayár and brons ...	...	...	...	...	...	...	...	...	...	...	...	...
Sál ...	20	1,000	1,000	48	1,440	960	174	1,740	1,392	471	942	1,884
Sain ...	5	250	275	6	180	120	39	312	390	82	...	492
Cypress ...	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	29	1,650	1,435	63	2,160	1,305	228	2,352	1,962	575	942	2,530

Reproduction.—In the chír fringe the seedlings of that species occur to the extent of about 0·2. In the sál belts young sál is fairly abundant (co-efficient 0·4), but even this young growth is lopped every year to provide the usual covering for turmeric fields, and the severe lopping of trees old enough to bear seed effectually prevents new reproduction. Elsewhere reproduction is very backward (co-efficient 0·1 to 0·3) and comprises only inferior, chiefly scrubby, species.

Grazing.—Heavy in all accessible portions (about one-third of the compartment).

Export lines.—Nil.

Kuria 3.

Boundaries.—North and east, spur separating compartment from Kuria 2 and 9; south, village lands of Saria Tál; west, prominent spur separating compartment from Kuria 4.

Area.—39 acres, of which 10 unproductive.

Configuration and aspect.—This compartment occupies the deep narrow bay formed by a small stream falling rapidly southwards into the Bhalia nadi. The aspect is hence southerly, and the slopes very steep and often breaking into scarps. The ground falls nearly 1,600 feet in about 1,500 feet.

Elevation.—Maximum 4,850 feet, minimum 3,850 feet, mean about 4,300 feet.

Soil and underlying rock.—As in Kuria 3. Inclined to slip owing to steepness of gradients.

Stock.—The stock, averaging a density of about 0·5, consists chiefly of koiral, sandhan, kanwál and other scrubby species, a few sain occurring in the lower portion of the compartment, some wretched sál along the ridges, and still fewer stunted chír near the main ridge at the top.

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chír ...	1	100	40	6	360	150	4	89	48	17	...	119
Oaks ...	...	...	...	...	...	...	...	...	...	...	...	...
Ayár and brong ...	...	...	...	...	...	...	...	...	...	...	...	...
Sal ...	1	50	50	1	30	20	9	90	72	25	50	100
Sain ...	1	50	55	6	180	120	26	208	260	69	...	414
Cypress ...	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	3	200	145	13	570	290	39	378	380	111	50	633

Reproduction.—The co-efficient for the whole compartment may be put down uniformly at 0·2. Reproduction here must always be difficult and protracted owing to the steep gradients.

Grazing.—Very light.

Export lines.—Nil.

Kuria 4.

Boundaries.—North and east, village lands of Debua Jála and Gethia, Kuria 5, and a prominent spur separating compartment from Kuria 3 and 9; village lands of Saria Tál and Kuria 1; south and west, the Bhalia nadi.

Enclosed private lands.—

Jaul Timli	...	...	...	...	...	6	acres.
Gotauni	...	...	...	...	...	15	,,
Bakarkhor	...	...	...	...	...	20	,,
Dakka Khet	...	...	...	...	...	25	,,

Area.—359 acres, of which 200 unproductive.

Configuration and aspect.—This is a straggling compartment containing numerous cultivation chaks and running along the Bhalia nadi from a level with the Brewery down to a point opposite Kasáni, a distance, as the crow flies, of just over two miles. Hence no further general description of the ground can be given than that the slopes are everywhere exceedingly steep (gradients 35° to 60°), are all drained into the Bhalia nadi, and have, as a rule, a south-westerly aspect.

Elevation.—Maximum 5,200 feet, minimum 3,000 feet, mean about 4,400 feet.

Soil and underlying rock.—Soil shallow, often wanting, resting on very loose shale, very prone to slip.

Stock—A few good patches of bánj occur in the higher portions and a dense growth, mainly of uncounted species, usually soft woods, fills the ravines. Otherwise the ground is extremely bare (average density 0·1). The numerous enclosed and surrounding cultivation chaks, with heavy grazing nearly all the year round, will prevent this compartment from ever bearing a productive crop.

Summary of valuation.—Nil: no survey made.

Reproduction.—Nil.

Grazing—Very heavy.

Export lines—The Ránibágh-Naini Tál cart-road runs through and along the boundary of this compartment for more than two miles, and numerous paths traverse it in every direction.

Kuria 5.

Boundaries.—North, Naini Tál cantonment and a prominent spur separating compartment from Kuria 6; east, village lands of Kuria and compartment 7; south, village lands of Gethia and Debua Jála and Kuria 4 and 8; west, the Bhalia nadi, separating compartment from Nalena 24, and Naini Tál municipality.

Enclosed village lands.—

Kimu khet No. 1	...	...	...	...	...	4 acres
Ditto No. 2	...	...	...	...	...	11 "
Achak of Gethia	...	..	...	...	...	2 "

Area.—200 acres, of which 100 unproductive.

Configuration and aspect.—This compartment is situated astride a spur-like ridge which forms the watershed line between the Bhalia nadi and Kuria gád. The slopes which are drained into the former stream look chiefly south-west, only a small area facing due south, while those belonging to the Kuria gád drainage system have a south-easterly aspect. The gradients are everywhere very steep, seldom falling below 35°.

Soil.—Soil sandy, very free, of variable depth, resting on shales and crumbling sandstones; excellent for bánj.

Stock.—Very variable. Except just along the Bhalia, the south-westerly and southerly slopes are generally huge grassy blanks or bare abrupt landslips. The slopes belonging to the drainage area of the Kuria gád are fairly well stocked (density 0·3 to 3·7) with bánj forest of moderately good growth.

Summary of valuation.—No survey was made, partly because there was nothing to count over more than half the area, and partly because whatever forest growth exists ought to be strictly preserved for the safety of the cart-road that zigzags through the compartment.

Reproduction.—Almost *nil* within the basin of the Bhalia; good (0·4), but much damaged and kept back by grazing elsewhere.

Grazing.—Very heavy.

Export lines.—The compartment is traversed in every direction by footpaths, and the Ránibágh-Naini Tál cart-road zigzags through it for more than three miles.

Kuria 6.

Boundaries.—North, Naini Tál cantonment and short spurs separating compartment from Bhawáli 29 and Kuria Kanta 4; east, village lands of Bhungárh, Aksára, and Kuria; the Bhawáli gadhera separating compartment from Bhawáli 24 and two short spurs separating it from Kuria 7; south, the Rátápani sot separating it from Kuria 8 and village lands of Gethia; west, old Ránibágh-Naini Tál cart-road and Naini Tál municipality lands.

Area.—191 acres, of which 80 unproductive.

Configuration and aspect—The compartment occupies the very steep slopes, many of them extremely rugged, below the southern boundary of the Naini Tál cantonment. All these slopes are drained by numerous sots and their feeders into the Kuriagád and have a south-easterly aspect. The gradients run, as a rule, from 30° to precipices.

Elevation—Maximum 6,022 feet, minimum 4,200 feet, mean about 5,000 feet.

Soil and underlying rock.—Considering the great extent of ground covered by this compartment, the soil in it varies remarkably little. It is generally argillo-silicious, but free, seldom deep, containing little vegetable mould, and resting for the most part on shales. An excellent soil for bánj and chír, if always kept well covered, a condition necessitated by the steepness of the slopes.

Stock.—Most of the slopes have been denuded either for cultivation or for fuel and timber, and, owing to their steepness, there is no hope of their being able, without artificial means, to cover themselves with forest under a century and a half. The ridge up which the cart-road winds is fairly clothed (0·5 to 0·8) with chír below and bánj above, and in the hollow bay above Kuria village dense (0·6 to 0·9) patches and belts, chiefly of banj, fill the ravines and gullies and other depressions and cover the moister spurs. Wherever there is forest, the growth is vigorous in spite of every adverse circumstance. The aggregate blanks are to the forest clothed area as 10 to 1.

Summary of valuation.—Owing to the bareness of the slopes and inadvisability of work for the next ten years at any rate, no enumeration survey has been made.

Reproduction.—Near standing forest reproduction, chiefly of bánj, is fair (co-efficient 0·3). Elsewhere the want of seed-bearers and the prevalence of heavy grazing renders natural reproduction a perfectly hopeless matter.

Grazing.—Heavy everywhere except on the steep, inaccessible slopes.

Export lines.—The Ránibágh-Naini Tál cart-road winds through the compartment for a distance of nearly seven miles and leaves it only to enter the Naini Tál cantonment.

Kuria 7.

Boundaries.—North and west, village lands of Kuria and Kuria 7 ; east, Kuriagád separating compartment from Kuria 13 and Bhawáli 24 ; south, Rátápáni sot separating it from Kuria 8 and 9.

Area.—146 acres, of which 40 unproductive.

Configuration and aspect.—This compartment sits across the spur forming the neck of land at the junction of the Kuriagád and Rátápáni sot. One face of this spur, comprising two-thirds of the total area, looks east and runs down with fairly steep gradients (25° to 35°) to the Kuriagád ; the other consists of very rugged southerly slopes overhanging the Rátápáni sot and none of them inclined at a smaller angle than 35°.

Elevation.—Maximum 4,800 feet, minimum 3,600 feet, mean about 4,300 feet.

Soil and underlying rock.—Soil clayey, generally superficial, resting on soft shales, prone to break away and form landslips ; excellent, if always tree-clad, for mixed banj forest.

Stock.—The ground is very badly covered, the average density being scarcely 0·2. The stock consists chiefly of low scrub of inferior species with a very slight sprinkling of miserable bánj. A few chír of poor growth fringes the crest of one of the spurs. The proximity of large cultivation areas combined with heavy grazing, the steepness of the slopes, and the friable nature of the rock will never allow the compartment to be covered again, even with a moderately good forest, without artificial aid and long continued protection.

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chír ...	4	400	160	16	960	400	14	280	168	15	...	105
Oaks ...	4	...	360	5	...	200	24	...	360	133	...	532
Ayár and brons ...	...	...	...	...	...	...	...	...	...	...	...	...
Sál ...	...	...	...	...	...	...	...	...	...	...	...	...
Sain ...	...	...	...	...	...	...	...	...	...	...	...	...
Cypress ...	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	8	400	520	21	960	600	38	280	528	148	...	637

Reproduction.—Scattered low bánj coppice clumps occur in most places. For all species taken collectively the co-efficient of reproduction may be put down at 0 2.

Grazing.—Very heavy.

Export lines.—None.

Kuria 8.

Boundaries.—North, the Rátápáni sot separating compartment from Kuria 5 and 7; east and south, village lands of Gothia and a prominent spur separating compartment from Kuria 9; west, village lands of Gethia, with about half a mile of the Ránibágh-Naini Tál cart-road running between.

Area.—92 acres, of which 20 unproductive.

Configuration and aspect.—This compartment occupies the slopes running down north from the Ránibágh-Naini Tál cart-road at Gethia to the Rátápáni sot. The flanks of two or three of the largest spurs produce easterly and westerly aspects. The gradients everywhere exceed 30° and often run up into scarps.

Elevation.—Maximum 5,000 feet, minimum 3,700 feet, mean about 4,500 feet.

Soil and underlying rock.—A sandy loam, fairly rich in mould, overlying loose shales; excellent for bánj or for mixed, forest of purely inferior species, according to elevation and aspect.

Stock.—The westerly flanks of the main spurs and the moister depressions bear almost pure bánj forest, while uncounted species, generally of scrubby growth, mainly clothe the remaining slopes. The average density is about 0·6, but the stock is quite complete in patches, such patches being numerous. The bánj has, as usual, suffered from heavy lopping. Generally the crop here is a very promising one as regards fuel.

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chír ...	...	...	...	...	...	...	...	...	...	...	...	...
Oaks ...	27	...	2,430	84	...	3,360	252	...	3,780	902	...	3,608
Ayár and brons ...	...	...	...	...	...	...	...	...	...	3	...	4½
Sál ...	...	...	...	...	...	...	...	...	...	...	...	...
Sain ...	...	...	...	...	...	...	...	...	...	...	...	...
Cypress ...	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	27	...	2,430	84	...	3,360	252	...	3,780	905	...	3,612½

Reproduction.—In bánj forest young coppice of that species is very abundant (co-efficient 0·7). Elsewhere also young growth is rapidly filling up existing gaps.

Grazing.—Light on account of the steep slopes.

Export lines.—As said above, the Ránibágh-Naini Tál cart-road forms the southern boundary of the compartment for about half a mile.

Kuria 9.

Boundaries.—North, prominent spur and lower course of Rátápáni sot separating compartment from Kuria 7 and 8; east, Kuriagád separating it from Kuria 11 and 13; south, prominent spurs separating it from Kuria 2, 3, and 10; west, village lands of Gethia and a prominent spur separating compartment from Kuria 4.

Area.—191 acres, of which 35 unproductive.

Configuration and aspect.—This compartment lies across several spurs, into which the great spur running down from the Kale Khán hill splits up below Gethia. The general fall of the ground is eastwards, but the numerous spurs just referred to produce every combination of easterly, northerly, and southerly aspects. Five sots, one of them forming a long deep bay, drain the slopes eastwards into the Kuriagád. The lines defining the crests of the spurs make an angle of only 25° to 30° with the horizontal, but the sides usually form gradients of from 35° to 50°.

Elevation.—Maximum 5,000 feet, minimum 3,200 feet, mean about 4,200 feet.

Soil and underlying rock.—Soil silicious, fairly deep and rich, resting on loose shales, except along southern boundary where the rock is sandstone, which sometimes passes into quartzite.

Stock.—Owing to the low elevation of the greater portion of the compartment, bánj, although vigorous, occurs in very limited quantity, while the shaly rock keeps out chír. The consequence is that, although the ground is pretty well covered (average density 0·6), the existing species comprise chiefly soft-wooded or scrubby trees. The upper part of the compartment has been at some time under cultivation.

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chír ...	30	3,000	1,200	70	4,200	1,750	74	1,480	888	27	...	189
Oaks ...	15	...	1,350	38	...	1,520	74	...	1,110	71	...	284
Ayár and brons ...	...	...	...	...	...	...	...	...	...	...	...	...
Sál ...	...	...	...	...	...	...	...	...	...	...	...	...
Sain ...	...	...	...	...	...	...	...	...	...	...	...	...
Cypress ...	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	45	3,000	2,550	108	4,200	3,270	148	1,480	1,998	98	...	473

Reproduction.—Young growth of chír and bánj is very rare, as also seedlings of the larger uncounted species.

Grazing.—Heavy.

Export lines.—The Ránibágh-Naini Tál cart-road skirts the upper end of the compartment.

Kuria 10.

Boundaries.—North, a small spur separating compartment from Kuria 9 and the Kuriagád separating it from Kuria 11; east, the Kuriagád separating it from

Kuria 11 ; south, main watershed ridge separating it from Kuria 1 and 2 ; west, spur separating it from Kuria 9.

Area.—118 acres, of which 30 unproductive.

Configuration and aspect.—This compartment occupies the very steep and often scarped and rugged north-easterly slopes that overhang the Kuriagád just above its junction with the Bhalia nadi. The gradients are seldom less than 35°, the gentler slopes being just below the main ridge.

Elevation.—Maximum 4,500 feet, minimum 2,800 feet, mean about 3,400 feet.

Soil and underlying rock.—Soil sandy, shallow or superficial, often absent and exposing the underlying sandstones, which pass into quartzite ; fair, where it exists, for chír and sál.

Stock.—The spurs and the main ridge bear some chír (density 0·1) of moderately good growth ; and between 4,000 and 4,400 feet of elevation, where the most gentle slopes occur, sál is the predominant tree in a crop of density 0·3 to 0·3. The sál trees are suffering from repeated severe lopping, but under the most favourable circumstances the mature sál tree will only exceptionally exceed 5 feet in girth and 50 feet in height. The sál belt contains a slight sprinkling of sain. Below this belt, right down to the Kuriagád, the crop consists of a scrubby growth of koiral, sándhan, kanwal, pharsaya, &c., averaging a density of 0·4. The sál and chír portions of the compartment are capable of much improvement, but there is very little promise for the slopes below.

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chír	14	1,400	500	55	3,300	1,375	89	1,780	1,068	120	...	840
Oaks ...	1	...	90	...	...	...	1	...	15	...	...	...
Ayár and brons ...	...	...	...	...	...	...	...	...	...	...	...	...
Sál	11	550	550	27	810	540	49	490	392	98	196	392
Sain	...	...	...	...	...	...	...	...	...	...	...	...
Cypress ...	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	26	1,950	1,200	82	4,110	1,915	139	2,270	1,475	218	196	1,232

Reproduction.—In the chír belts the advance growth, consisting of young seedlings, averages a co-efficient of only about 0·2, while in the sál belt, where it is composed chiefly of young coppice shoots, it is abundant (0·3 to 0·7) and promises to close over the ground soon if left undisturbed. Elsewhere reproduction, owing to the steepness of the slopes, is very backward and consists of mere bushy scrub of inferior species.

Grazing.—Very slight.

Export lines.—Nil.

Kuria 11.

Boundaries.—North, prominent spur separating compartment from Kuria 13 ; east, prominent spur separating it from Kuria 12 and Jioli-Shám Khet bridle-path ; south and west, Kuriagad separating compartment from Kuria 9 and 10.

Enclosed private lands.—Talla Garja, 2 acres.

Area.—248 acres, of which 90 unproductive.

Configuration and aspect.—This compartment occupies the deep bay enclosed between the two large spurs which form its northern and eastern boundaries.

Except round about Talla Garja, where the gradients vary between 20° and 35°, the ground is everywhere exceedingly steep, more than half the compartment consisting of precipices. The ground falls nearly 2,400 feet in less than one mile and deep gullies cut up the mountain side.

Elevation.—Maximum 5,183 feet, minimum 2,800 feet, mean about 4,200 feet.

Soil and underlying rock.—Owing to the steep and scarped slopes, the rock (hard sandstone) is nearly everywhere exposed, the few patches of soil being superficial, stony, and dry.

Stock.—A sprinkling of stunted storm-beaten chír is found along the crests of the spurs, and a few sain are met with along the Kuriagád, while a miserable scrub of inferior species occur along that gád and in patches higher up, wherever they can cling to the steep hill-sides. The greater portion of the compartment will always remain unproductive.

Summary of valuation.—Obviously no enumeration survey has been made.

Reproduction.—Nil.

Grazing.—Slight on the easier slopes near Talla Garja; otherwise *nil.*

Export lines.—As said before, the Jioli-Shám Khet district bridle-path forms for about half a mile the eastern boundary of the compartment, the interior of which is at present practically inaccessible.

Kuria 12.

Boundaries.—North and east, village lands of Tircha Khet and Jioli-Shám Khet bridle-path, forming outer boundary of the forest; south and west, two spurs separating compartment respectively from Kuria 11 and 13.

Area.—70 acres, of which 15 unproductive.

Configuration and aspect.—This compartment occupies the steep (gradients from 30° to 50°) easterly slopes which overhang a feeder of the Kuriagád.

Elevation.—Maximum 5,183 feet, minimum 4,000 feet, mean 4,700 feet.

Soil.—Sandy, shallow, dry, overlying freely-fissured sandstone, fragments of all sizes of which strew the ground.

Stock.—Stunted, storm-beaten chír fringe the crests of the spurs. The lower slopes in the southern half of the compartment are fairly well covered (0·6) with a growth of uncounted species. Elsewhere the ground is rather bare, the density being scarcely 0·2.

Summary of valuation.—No enumeration survey was made owing to the very inferior stock.

Reproduction.—On the lower slopes saplings and small poles of uncounted species are gradually filling up the forest. Elsewhere the co-efficient of completeness is barely 0·1.

Grazing.—Heavy in all the northern half of compartment.

Export lines.—The compartment rests up against the Jioli-Shám Khet bridle-path.

Kuria 13.

Boundaries.—North, prominent ridge separating compartment from Bhawáli 24; east, village lands of Tircha Khet and prominent ridge separating compartment from Kuria 12; south, prominent spur separating it from Kuria 11; west, Kuriagád separating it from Kuria 7 and 9.

Area.—265 acres, of which 200 unproductive.

Configuration and aspect.—The whole of this large compartment is situated on the precipitous slopes, which, coming down from the great ridge above Tircha Khet, are drained south-westwards into the Kuriagád. The mountain side is cut into by two deep ravines with almost scarped sides which start from the top of the ridge, and also by numerous smaller ravines with almost sheer drops for sides. These irregular and abrupt contours of the ground produce every combination of westerly, northerly, southerly, and very slightly easterly aspects, which may, however, be generally classified thus:—One fourth south-westerly, one-fourth westerly, one-sixth southerly, one-twelfth south-easterly, and one-fourth north-westerly.

Elevation.—Maximum 5,653 feet, minimum 3,400 feet, mean about 4,700 feet.

Soil.—Except at the bottom of the deeper ravines, where there are often patches of fairly deep moist rich soil, the underlying hard sandstone is nearly everywhere exposed.

Stock.—The deeper ravines contain various belts of fairly-grown chir presenting a density of about 0·4 Everywhere else forest growth is practically absent.

Summary of valuation.—On account of the almost total absence of stock and the precipitous ground no valuation has been made.

Reproduction.—In the pine belts seedlings of that species average a co-efficient of about 0·3 ; elsewhere of course the co-efficient is 0·0.

Grazing.—Nil.

Export lines.—None.

CHAPTER III.—LARIA KÁNTA BLOCK.

Boundaries.—North, the Bhawáli block and village lands of Dunikhal with the Bhawáli gadhera running between, and village lands of Bhawáli ; east, the Bhawáli block, from which it is separated partly by the Jábar Raula, but chiefly by a prominent ridge and spur ; south, Naini Tál cantonment ; west, Naini Tál municipality and Jákh block, separating the former by a main ridge, the latter by the Jákh nadi.

Area.—1,860 acres, of which 425 unproductive.

Number of component compartments.—11.

Configuration and aspect.—This block sits astride the great ridge which runs down east from Laria Kánta and forms part of the watershed line between the drainage basin of the Kosi on the north and of the Gola nadi on the south. The northern face of the ridge is drained, the eastern two-thirds directly into the Bhawáli gadhera, the western third into the Jákh nadi, while the southern face contains the headwaters of the Kuriagád. The ground is generally very rugged and steep, being broken up into deep bays with precipitous sides.

Elevation.—Maximum 8,144 feet, minimum about 5,300 feet, mean about 7,000 feet.

Soil and underlying rock.—The rock formation consists of shales with superposed, much-crushed, often quartzitic sandstone, the whole topped by krol limestone, which forms the backbone of the mountain. As a rule, the soil is a rich loam and exists in sufficient quantity everywhere where the slopes are not scarped of the ground broken away by landslips, which, owing to steep gradients and the crumpled, fissured nature of the rocks, are both numerous and extensive, especially on the face overhanging the Jákh nadi and are easily produced. Many of the streams contain water all the

year round, the cantonment deriving part of its water-supply from those in the vicinity ; and the subsoil is generally moist. The higher slopes and the cooler aspects are excellently adapted for oak forest, while chír can flourish on all the drier and lower slopes. The covering of vegetable detritus is very slight, except in scattered places where the forest is full ; and brushwood forming a close undergrowth is rare, although grass, usually short and spare, comes up nerly everywhere.

Stock.—The slopes which are drained into the Kuriagád are, as a rule, rather bare ; the central portion is well stocked, but on each side are generally seen either blanks with groups of stunted crooked trees standing out here and there, especially in depressions and recesses in the hill side, or an irregular sprinkling of trees quite insufficient to protect the ground and resow it completely within a limited period of time. Oak forest forms the prevailing type, chír, nearly all young trees, being chiefly confined to the crests of the lower spurs and the lower drier slopes. Kharsu is all but absent and tilonj is not abundant, the principal oaks being bánj and the rare species riánj. It is worthy of remark that this last oak attains its widest distribution here ; it is very numerous in the central portion of these slopes and is almost pure along and just below the main ridge. As is to be expected, reproduction is excellent on the central slopes, advance growth of riánj and bánj being abundant there under and round seed-bearing trees on both sides of the Almora road ; seedlings and saplings of tilonj are numerous in patches at the higher elevation and chír; seedlings sprinkle the ground well below the oak forest. East of these slopes reproduction is extremely backward, owing partly to the absence of a sufficient number of seed-bearing trees, partly to exposure to sun and strong winds, and partly to heavy grazing. On the cantonment side, where the slopes are higher and better sheltered, and therefore cooler and moister, advance growth in the shape chiefly of young oak coppice occurs a little more than half way up to the main ridge in patches wherever there is sufficient soil ; above this the gradients are too steep, or the ground too rocky or seed-bearers too few or shelter against sun and storms insufficient, to admit of natural regeneration within a reasonable period of time.

The northern face of the ridge is much better clothed than the one just described. As in this latter, the central portion is here also the best stocked, the co-efficient of density ranging, if a few open places on bad ground be excepted, from 0·7 to 1·0. These open places are either the steep flanks of spurs, where the forest stands out in patches in the midst of grassy blanks, or are high, exposed, rocky ridges, or form the line of separation between oak and brons forest, filling the ravines and gullies below on the one hand and chír forest crowning and fringing the lower spurs above on the other. The eastern end of this northern face has been heavily cut over not many years ago, and now contains chiefly young bánj coppice which is coming up very thickly in most places ; a few chír poles and young trees are, however, left along some of the lower spurs. On the west the slopes overhanging the Jákh nadi are very irregularly stocked. The ravines and deep gullies and the neighbourhood of the Jákh nadi are, as a rule, well filled with oak (tilonj or bánj according to the elevation) and brons forest. Forest of the same description, but much more open, also stands on the sheltered, higher and cooler slopes, while the middle slopes are either (if they are rocky and very steep, or broken away by landslips) more or less bare, or sprinkled with fairly well-grown chír mixed in places with a little bánj and brons. As regards reproduction, the whole northern face, with the exception of some extremely unfavourable places, is in a fair way of clothing itself completely with new growth, chír of all ages being abundant along crests of spurs or on dry warm slopes, and coppice of oak and other broad-leaved trees coming up in profusion in the midst of and around oak and brons forest. At the eastern extremity of this face is situated the Jábar plantation, where deodar has been planted, about 8 feet apart each way, in the midst of bánj coppice on the northerly slopes immediately below the Ghura Dhar. The deodars areapparently healthy and doing well, some of the plants being already more

than 20 feet high. The average height is, however, only about 6 feet, and the young plants do not possess that slender graceful appearance which seems to me to be an unmistakeable sign that the species is thriving and capable of acquiring its finest dimensions. Some of the seedlings were raised in temporary nurseries *in situ*, others were brought from Ránikhet.

Considered as a whole, the Laria Kánta block contains within it elements which, if properly husbanded and aided, will very soon make it one of the most valuable portions of the Naini Tál forests.

Species.	Diameter-class.	Compartment 1, area 125 acres.		Compartment 2, area 129 acres.		Compartment 3, area 177 acres.		Compartment 4, area 219 acres.		Compartment 5, area 168 acres.		Compartment 6, area 208 acres.	
		Gross number of trees.	Number of trees per acre.	Gross number of trees.	Number of trees per acre.	Gross number of trees.	Number of trees per acre.	Gross number of trees.	Number of trees per acre.	Gross number of trees.	Number of trees per acres.	Gross number of trees.	Number of trees per acres.
Chír ...	I	...	...	...	...	1	0·01	41	0·19	6	0·04	1	0·00
	II	..	...	7	0·05	6	0·03	159	0·73	55	0·33	35	0·17
	III	...	...	7	0·05	34	0·24	224	1·02	208	1·24	180	0·87
	IV	...	...	214	1·66	1,360	7·68	507	2·32	221	1·32	280	1·35
Totals ...		...	...	228	1·77	1,410	7·97	931	4·25	490	2·92	496	2·38
Bánj ...	I	...	...	134	1·04	234	1·32	244	1·11	455	2·71	122	0·58
	II	...	...	139	1·08	345	1·95	419	1·91	549	3·27	230	1·10
	III	...	...	284	2·20	895	5·06	841	3·84	989	5·89	496	2·38
	IV	...	...	583	4·52	2,304	13·02	953	4·35	1,890	11·25	748	3·59
Totals ...		...	...	1,140	8·84	3,778	21·34	2,457	11·22	3·883	23·11	1,596	7·67
Tilonj ...	I	...	...	66	0·51	23	0·13	...	...	3	0·02	...	...
	II	...	...	95	0·71	93	0·53	...	...	2	0·01	...	...
	III	...	...	222	1·74	328	1·85	...	...	7	0·04	...	...
	IV	...	...	304	2·36	1,001	5·65	...	...	8	0·05	...	...
Totas ...		...	...	687	5·33	1,445	8·16	...	...	20	0·12	...	...
Riánj ...	I	...	...	1	0·01	245	1·38	27	0·12	77	0·46	4	0·01
	II	...	...	1	0·01	357	2·02	44	0·20	118	0·70	17	0·08
	III	...	...	4	0·03	1,042	5·89	122	0·56	202	1·20	51	0·24
	IV	...	...	7	0·05	2,751	15·54	151	0·69	390	2·32	126	0·60
Totals ...		...	...	13	0·10	4,395	24·83	344	1·57	787	4·68	198	0·95
Kharsu ...	I	...	...	3	0·02	...	...	...	...	...	...	...	...
	II	...	...	7	0·05	...	...	...	...	...	...	...	...
	III	...	...	5	0·04	...	...	...	...	...	...	...	...
	IV	...	...	31	0·24	...	...	...	...	...	...	...	...
Totals ...		...	...	46	0·35	...	...	...	...	...	...	...	...
Brons ...	I	...	...	21	0·16	44	0·25	18	0·08	17	0·10	40	0·20
	II	...	...	79	0·61	113	0·64	32	0·15	40	0·24	151	0·72
	III	...	...	231	1·80	501	2·83	95	0·43	100	0·60	196	0·94
	IV	...	...	503	3·90	1,981	11·19	112	0·51	278	1·65	612	2·94
Totals ...		...	...	834	6·47	2,639	14·91	257	1·17	435	2·59	999	4·80
Ayár ...	I	...	...	11	0·09	0	0·00	3	0·01	1	0·01	4	0·01
	II	...	...	16	0·12	3	0·02	3	0·01	7	0·04	23	0·11
	III	...	...	51	0·40	48	0·27	21	0·10	18	0·10	111	0·54
	IV	...	...	236	1·83	567	3·20	16	0·07	106	0·63	424	2·04
Totals ...		...	...	314	2·43	618	3·49	43	0·19	132	0·78	562	2·70
GRAND TOTALS,		..	...	3,262	25·29	14,285	80·70	4,032	18·40	5,747	34·21	3,851	1·859

Compartment 7, area 145 acres.		*Compartment 8, area 130 acres.*		*Compartment 9, area 242 acres.*		*Compartment 10, area 205 acres.*		*Compartment 11, area 112 acres.*		*Entire block, area 1,860 acres.*	
Gross number of trees.	Number of trees per acre.	Gross number of trees.	Number of trees per acre.	Gross number of trees.	Number of trees per acre.	Gross number of trees.	Number of trees per acre.	Gross number of trees.	Number of trees per acre.	Gross number of trees.	Number of trees per acre.
6	0·04	12	0·09	15	0·06	49	0·24	77	0·68	208	0·11
79	0·54	49	0·37	35	0·14	87	0·43	203	1·81	715	0·39
210	1·44	294	2·26	137	0·56	342	1,66	204	1·82	1,849	1·00
898	6·19	1,965	15·12	908	3·75	461	2·24	328	2·92	7,142	3·84
1,193	8·22	2,320	17·85	1,095	4·52	989	4·18	812	7·25	9,914	5·33
310	2·13	456	3·50	717	2·96	451	2·20	151	1·34	3,274	1·77
343	2·37	437	3·36	971	4·01	399	1·94	281	2·50	4,113	2·21
557	3·84	880	6·76	1,509	6·23	581	2·83	470	4·19	7,502	4·03
635	4·38	3,042	23·40	2,600	10·74	998	4·86	671	5·99	14,424	7·76
1,845	12·72	4,815	37·04	5,797	23·91	2,429	11·84	1,573	14·04	29,313	15·77
193	1·33	13	0·10	610	9·52	317	1·55	9	0·08	1,234	0·66
210	1·44	17	0·13	462	1·90	270	1·32	31	0·27	1,180	0·63
328	2·26	22	0·17	757	3·12	358	1·74	62	0·55	2,084	1·12
491	3·38	73	0·56	1,315	5·43	736	3·59	68	0·60	3,996	2·14
1,222	8·42	125	0·96	3,144	12·99	1,681	8·20	170	1·51	8,494	4·56
10	0·07	...	...	...	...	...	...	...	...	364	0·19
17	0.12	...	...	...	...	...	...	...	...	554	0·29
13	0.00	...	...	...	...	...	..	...	...	1,434	0·77
43	0.30	...	...	...	...	...	...	...	...	3,468	1·86
83	0.57	...	...	...	...	...	...	...	...	5,820	3·12
...	...	...	...	...	...	...	...	...	...	3	...
...	...	...	...	...	...	...	...	...	...	7	...
...	...	...	...	...	...	...	...	...	...	5	...
...	...	...	...	...	...	...	...	...	...	31	0·01
...	...	...	...	...	...	...	...	...	...	46	0·02
253	1.74	205	1·57	365	1·51	129	0·63	12	0·10	1,104	0·59
485	3.34	596	4·58	840	3·47	259	1·26	90	0·80	2,685	1·44
972	6.70	1,756	13·51	2,226	9·20	717	3·49	360	3·21	7,154	3·84
2,331	16·07	5,127	39·44	4,434	18·32	2,801	11·22	933	8·33	18,612	10·00
4,041	28.86	7,684	59·10	7,865	32·50	3,406	16·61	1,395	12·45	29,555	15·88
28	0·19	24	0·18	45	0·18	26	0·12	2	0·01	144	0·07
98	0·67	115	0·88	131	0·54	54	0·26	17	0·15	467	0·26
426	2.93	522	4·01	777	3·21	145	0·70	76	0·67	2,195	1·18
1,600	11·03	1,832	14·09	2,121	8·77	685	3·34	341	3·04	7,928	4·26
2,152	14.84	2,493	19·17	3,074	12·74	910	4·43	436	3·89	10,734	5·78
10,536	72·63	17,437	134·08	20,975	86·67	9,365	45·68	4,386	39·16	93,876	50·48

Grazing.—This block has fortunately no villages or cultivation inside it, and the only adjoining villages of Bhawáli and Duni khál make little use of it, as they find better grazing-grounds elsewhere. During a part of the year, however, a large herd of cattle is regularly pastured on the easy slopes at the southern corner and prevent forest reproduction there.

Export lines.—With more than a third of its boundary marching with that of the cantonment and station of Naini Tál, the block is admirably situated for export. This is greatly facilitated by the several roads which traverse it, the principal among them being the new cart-road from Ránikhet, the excellent bridle-road from Almora, and the forest bridle-road from Bhawáli.

Laria Kánta 1.

Boundaries.—North and west, Naini Tál municipality ; east, deep sot and spur separating compartment from Laria Kánta 2 and Naini Tál cantonment ; south, Naini Tál cantonment.

Area.—126 acres, of which 40 unproductive.

Configuration and aspect.—This compartment occupies the very steep (gradients always above 30°) rugged, easterly slopes drained by the Udfári sot, and which immediately overhang the portion of the upper Almora road flanking the cantonment lands.

Elevation.—Maximum 7,877 feet, minimum 6,700 feet, mean 7,200 feet.

Soil and underlying rock.—A rich loam, but usually superficial, resting along the upper half of the compartment on krol limestone, elsewhere on shales ; good for kosa.

Stock.—Chiefly tilonj forest at the higher elevation and bánj below. The forest growth generally stands out in patches in the midst of completely bare or grassy blanks, especially in the northern portion of the compartment. The trees are usually stunted and crooked. On account of the steep slopes, the inferior stock, and the fact that the compartment lies jammed in between the civil station on the one side and the cantonment on the other, no enumeration survey has been made.

Reproduction.—In the southern half the advance growth is fairly abundant (0·5), occurring generally in patches of saplings and small poles of both tilonj and bánj ; elsewhere it is very backward (0·1).

Grazing.—Nil.

Export lines.—The compartment rests up against the upper Almora road along the cantonment boundary.

Laria Kánta 2.

Boundaries.—North, the great Laria Kánta ridge separating compartment from Laria Kánta 9 and 10 ; east, deep sot and part of Naini Tál-Almora bridle-road separating it from Laria Kánta 3 ; south, Naini Tal cantonment ; west, deep sot and spur separating it from Laria Kánta 1, and Naini Tál municipal lands.

Area.—129 acres, of which 40 unproductive.

Configuration and aspect.—This compartment also, like Laria Kánta 3, occupies slopes running down from the great Laria Kánta ridge to the Udfári sot, but the ground is much steeper and much more rugged. The aspect is south and south-east. The whole compartment is exposed to the full fury of south-east winds.

Elevation.—Maximum 8,144 feet, minimum 6,400 feet, mean about 7,200 feet.

Soil and underlying rock.—A sandy loam, superficial in the higher portions, becoming deeper lower down, but never very deep, resting on generally reddish shales, with the krol limestone often cropping out near the Laria Kánta ridge.

Stock.—The upper third of the compartment is very bare, the density being scarcely 0·1 ; elsewhere the average density is about 0·4. The composition and condition of the crop are nearly the same as in Laria Kánta 3; the exception being that riánj has almost disappeared and kharsu has put in an appearance, and that the proportion of chír has considerably decreased.

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chír ...	...	...	...	7	420	175	7	140	84	214	...	1,498
Oaks ...	204	...	18,360	242	...	9,680	515	...	7,725	925	...	7,700
Ayár and brons ...	32	...	1,120	95	...	1,710	282	...	1,692	739	...	1,108
Sál ...	...	...	...	...	...	...	...	...	...	...	...	...
Sain ...	...	...	...	...	...	...	...	...	...	...	...	...
Cypress ...	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	236	...	19,480	344	420	11,565	804	140	9,501	1,878	...	6,306

Reproduction.—Almost *nil* in the upper third of the compartment, owing to absence of sufficient seed-bearers, steepness of ground, and complete exposure to atmospheric influences. Below this young seedlings and coppice saplings and low poles of oaks aggregate a co-efficient of about 0·5.

Grazing.—Nil.

Export lines.—The Naini Tál-Almora district and the Laria Kánta pic-nic bridle-roads run respectively along the southern, northern, and part of the eastern boundaries of the compartment.

Laria Kánta 3.

Boundaries.—North, the great Laria Kánta ridge separating compartment from Laria Kánta 7 ; east, prominent spur separating it from Laria Kánta 5 and 6; south, Naini Tál cantonment; west, a well-defined sot and Naini Tál-Almora bridle-road separating it from Laria Kánta 2.

Area.—177 acres, of which 40 unproductive.

Configuration and aspect.—This compartment occupies the very steep (gradients 30° to 50°) south-easterly and south-westerly slopes that come down from the great Laria Kánta ridge to the Udíári sot. The contours of the slopes are very sharp and irregular and render the ground extremely rugged. The total fall is 2,050 feet in one and half miles.

Elevation.—Maximum 7,948 feet, minimum 5,500 feet, mean 6,900 feet.

Soil and underlying rock.—As in adjoining compartment 2, but generally less superficial and less often absent.

Stock.—This compartment is on the whole a very densely stocked one. Roughly speaking, the density in the upper third of the area, owing, no doubt, to the height and exposed character of the solpes, is only 0·5 to 0·6, but below this the crop is almost complete. Chír, of fair growth and forming the predominant tree, is

limited principally to the portion of the compartment below the Naini Tál-Almora road. The rest of the crop consists of bánj, riánj, and tilonj, the first growing lowest and the last highest, and of brons, and to a slight extent of ayár. The relative proportions of the oaks, in the order in which they are named, are nearly as 22 : 24 : 9. This oak forest consists mainly of a coppice of crooked, short-boled, branchy poles.

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chír ...	1	100	40	6	360	150	43	860	516	1,360	...	9,520
Oaks ...	502	...	45,180	795	...	31,800	2,265	...	33,975	6,056	...	24,224
Ayár and brons ...	44	...	1,540	116	...	2,088	549	...	3,294	2,548	...	3,822
Sál ...	...	...	...	...	...	...	...	...	...	...	...	...
Sain ...	...	...	...	...	...	...	...	...	...	...	...	...
Cypress ...	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	547	100	46,760	917	360	34,038	2,857	860	37,785	9,964	...	37,566

Reproduction.—The reproduction of the oaks is excellent, as is also that of chír below the Almora road. The co-efficient for the upper third of the compartment may be put down at 0·5 ; below this nearly every gap in the leaf canopy has a complete crop of young growth on it, which will soon close over the ground.

Grazing.—Nil.

Export lines.—The Laria Kánta pic-nic road forms half the northern boundary of the compartment, and the Naini Tál-Almora district bridle-road runs through the compartment about 300 feet below its middle.

Laria Kánta 4.

Boundaries.—North, Naini Tal-Almora bridle-road and a footpath separating compartment from Laria Kánta 5 ; east, the same footpath and a spur separating it from Kuria 7, Bhuwáli 29, and Laria Kánta 5 ; west, Naini Tál Cantonment and a short ridge and part of Naini Tál-Almora bridle-road separating compartment from Laria Kánta 3.

Area.—219 acres, of which 35 unproductive.

Configuration and aspect.—This compartment comprises the lower half of the bay formed by the Jioli rau. The ground throughout is rugged and cut up by numerous deep ravines and gullies. The gradients vary from 30° to sheer scarps. The general fall of the ground is southwards, but the sides of the bay have respectively also easterly and westerly aspects.

Elevation.—Maximum 6,400 feet, minimum 4,872 feet, mean about 5,600 feet.

Soil and underlying rock.—In the upper fourth of the compartment the argillaceous deep rich, full of fragments of the underlying shales, excellent for bánj and riánj ; elsewhere shallow, stony, dry, liable to landslips, the underlying, the alternating shale and sandstone cropping out frequently.

Stock.—In the upper fourth of the compartment, a few small blanks excepted, the density is about 0·7, the stock consisting chiefly of bánj and riánj in the proportion of 3 to 1, with an abundant sprinkling of brons and a few rare ayár and chír. Below this we find chír of moderately good growth along the spurs (density 0·2) and patches (density 0·5) of fairly vigorous crooked bánj in the ravines ; elsewhere the ground is extremely bare.

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chír ...	41	4,100	1,640	159	9,540	3,975	224	4,480	2,688	507	...	3,549
Oaks ...	271	...	24,300	463	...	18,520	963	...	14,445	1,104	...	4,416
Ayár and brons ...	21	...	735	35	...	630	116	...	696	128	...	192
Sál ...	...	...	...	...	...	...	...	...	...	...	...	...
Sain ...	...	...	...	...	...	...	...	...	...	...	...	...
Cypress ...	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	333	4,100	26,765	657	9,540	23,125	1,303	4,480	17,829	1,739	...	8,157

Reproduction.—In the upper fourth of the compartment seedlings and young coppice clumps of riánj and bánj, especially the former, are abundant and very promising (co-efficient 0·6). Elsewhere the mean co-efficient is only 0·1, the ground being trodden hard and unfitted for the reception of seed by the heavy grazing.

Grazing.—Very heavy in the greater portion of the compartment.

Export lines.—The Naini Tál-Almora district bridle-road runs for more than a quarter mile along the northern boundary of the compartment, and several footpaths traverse it leading up to the depôt limits.

Laria Kánta 5.

Boundaries.—North, the great Ghura Dhár ridge separating compartment from Laria Kánta 6; east, prominent spur separating it from Bhawáli 28; south, spur separating it from Bhawáli 29, and a footpath and Naini Tál-Almora bridle-road separating it from Laria Kánta 4; west, prominent spur separating it from Laria Kánta 3.

Area.—168 acres, of which 45 unproductive.

Configuration and aspect.—This compartment is situated at the head of a large bay below the Laria Kánta ridge formed by a portion of the head-waters of the Jioli rau, which is itself a feeder of the Kuriagád. The gradients are everywhere steep, varying from 35° to 50°; but whereas in the eastern half of the area the slopes are more or less uniform, in the western half they are very rugged and cut up by deep gullies. The general aspect is southerly, but some slopes also look east and south.

Elevation.—Maximum 7,050 feet, minimum 6,200 feet, mean 6,600 feet.

Soil and underlying rock.—In the western half of the compartment the soil is similar to that described for the upper quarter of Laria Kánta 4. In the eastern half it is shallow and rocky, the underlying conglomeratic sandstone being exposed in most places, and it is altogether an inferior forest soil, although a considerable portion of it has been under terrace cultivation within the last seven or eight years.

Stock.—In the eastern half of the compartment the stock is very spare (density 0·1) and consists of chír and bánj in about equal proportions, the chír of moderately fair growth, the bánj stunted, crooked, branchy, and languishing. In the western half, if a few small blanks be excepted, the mean density is 0·5, and the crop consists chiefly of bánj, mixed in places, where the soil is good and moist, with an equal proportion of riánj, which, however, becomes all but pure along the line of watershed bounding the compartment on the north. There is also a sprinkling of chír, brons, and ayár and a few tilonj.

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of feet.	Cubic feet of timber.	Maunds of fuel.
Chír ...	6	600	240	55	3,300	1,375	208	4,160	2,496	221	...	1,547
Oaks ...	535	...	48,150	669	...	26,760	1,198	...	17,970	2,288	...	9,152
Ayár and brons ...	18	...	630	47	...	846	118	...	708	384	...	576
Sál ...	...	...	...	...	...	...	...	...	...	...	...	...
Sain ...	...	...	...	...	...	...	...	...	...	...	...	...
Cypress ...	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	559	609	49,020	771	3,300	28,981	1,524	4,160	21,174	2,893	...	11,275

Reproduction.—In the eastern half almost *nil.* Elsewhere the co-efficient is almost uniformly 0·5, the young growth consisting chiefly of vigorous bánj and riánj of all ages. Wherever seed-bearing rianj trees occur, there seedlings of that species are remarkably abundant.

Grazing.—Very heavy in the eastern half, where a *got* is established.

Export lines.—The Naini Tál-Almora district bridle-road traverses the whole length of the compartment through its middle, emerging on the west within a mile of the cantonment.

Laria Kánta 6.

Boundaries.—North, main ridge separating compartment from Bhawáli 16; east, prominent spur separating it from Bhawáli 18 and 28; south, main watershed line (Ghura Dhár) between the Jákh and Sáth Tál systems of drainage, separating it from Laria Kánta 3 and 5; west, prominent spur separating it from Laria Kánta 7.

Area.—186 acres closed for 10 years (*vide North-Western Provinces and Oudh Gazette* Notification No. 150), 40 acres open; total area 220 acres, of which 40 acres unproductive.

Configuration and aspect.—This compartment occupies the deep funnel-shaped basin formed by the head-waters of the Jábar raula, which drains a continuation of the northerly slopes descending from the great Laria Kánta ridge. The slopes are generally very steep (30° to 50°), especially in the immediate vicinity of the largest and central stream and just below the main ridge. The general aspect is, of course, northerly, but the two sides of the basin look respectively east and west.

Elevation.—Maximum 7,800 feet, minimum 6,000 feet, mean about 6,600 feet.

Soil and underlying rock.—Sandy, of very variable depth, sometimes superficial or absent, as along the main ridge, but generally fairly deep, often loamy and rich, moist, overlying shales or loosely bedded, finely conglomeratic sandstone, with here and there an outcrop of black krol limestone; excellent for bánj and tilonj.

Stock.—The slope on the left of the central sot is thickly sprinkled (0·2 to 0·4) with stunted bánj, brons, chír, and ayár. The main ridge (Ghura Dhár) is fringed with fairly dense low coppice of bánj, with a few riánj at the top. The rest of the compartment is more or less blank or covered with shrubby growth. Ringáls are plentiful in the lower part of compartment. A great portion of the compartment must have been under cultivation not many years ago.

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chír ...	1	100	40	35	2,100	875	180	3,600	2,160	280	...	1,960
Oaks ...	126	...	11,340	247	...	9,810	547	...	8,205	874	...	3,496
Ayár and brons ...	44	...	1,540	174	...	3,132	307	...	1,842	1,036	...	1,554
Sál	...	...	...	...	...	...	...	...	...	...	...	...
Sain	...	...	...	...	...	...	...	...	...	...	...	...
Cypress ...	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	171	100	12,920	456	2,100	13,817	1,034	3,600	12,207	2,190	...	7,010

Reproduction.—Very poor as regards recent seedlings, owing to the absence of sufficient seed-bearers, but low coppice growth of bánj, rhododendron, and ayár of comparatively great age, but just pushing up, will go very far to cover the ground over half the total area. In the upper portion of this compartment, on the slopes immediately below the main ridge, deodar has been planted over an area of about 147 acres. An account of this plantation has already been given on pp. 29-30 and 86-87.

Grazing.—Nil, nearly the whole compartment being closed.

Export lines.—A well-used footpath traversing the compartment and passing over the main watershed meets the Almora road a little more than a mile from the cantonment boundary.

Laria Kánta 7.

Boundaries.—North and west, prominent ridge and spur separating compartment from Laria Kánta 8 and 9; east, prominent spur and partly a short artificial line separating it from Bhawáli 15 and 16 and Laria Kánta 6; south, the great Laria Kánta ridge separating it from Laria Kánta 3.

Area.—145 acres, of which 35 unproductive.

Configuration and aspect.—This compartment occupies the upper half of the basin of an important feeder of the Bhawáli gadhera. From the Laria Kánta ridge the ground falls in easy gradients (15° to 25°) for about a quarter of a mile. The slopes forming the edge of the basin also generally affect similar slopes, while the ground everywhere else is very steep, and even precipitous on the right side of the main watercourse. The general fall of the ground is, of course, north-east, but the slopes on the right and left of the central stream have respectively a westerly and easterly outlook. The greater portion of the compartment is exposed to the direct brunt of strong winds.

Elevation.—Maximum 7,948 feet, minimum 5,900 feet, mean about 7,000 feet.

Soil and underlying rock.—Soil sandy, fairly deep and rich in the ravines and on most of the westerly slopes; elsewhere generally superficial, exposing in a great many places jutting crags of the underlying shales and loosely bedded sandstones, the latter of which become occasionally quartzitic. Fragments of all sizes of these rocks are found mixed with or strewing the soil. Good soil for bánj and tilonj and for brons and ayár.

Stock.—The ravines and depressions are fairly well filled (0·7 to 0·9) with oak and burans and ayár forest, banj being the species of oak prevailing in the lower and tilonj in the upper half of the compartment; some of the oak trees are of large dimensions, and the stock is generally of vigorous growth. Elsewhere the forest stands in small patches in the midst of grassy blanks, and is composed of tilonj, bánj, brons,

and ayár in varying proportions, with a rare chír at wide intervals. The trees are generally stunted and show the effects of exposure to strong winds.

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chír ...	6	600	240	79	4,740	1,975	210	4,200	2,520	898	...	6,286
Oak ...	513	...	46,170	570	...	22,800	898	...	13,470	1,169	...	4,676
Ayár and brons ...	281	...	9,835	583	...	10,494	1,398	...	8,388	3,931	...	5,896
Sál ...	...	...	...	...	...	...	...	...	...	...	...	...
Sain ...	...	...	...	...	...	...	...	...	...	...	...	...
Cypress ...	...	...	...	...	...	...	...	...	...	...	...	...
Total ..	800	600	56,245	1,232	4,740	35,269	2,506	4,200	24,378	5,998	...	16,858

Reproduction.—Very poor, although seedlings and young coppice of tilonj are abundant under and near seed-bearing trees, and a thick belt of brons and ayár coppice fringes the ridge forming the western boundary of the compartment. The grassy blanks have scarcely a single seedling on them.

Grazing.—Nil.

Export lines.—The Laria Kánta picnic road forms half the southern boundary of the compartment.

Laria Kánta 8.

Boundaries.—North, village lands of Bhawáli, and very partially the gadhera of that name separating the compartment from Bhawáli 13; east and south, village lands of Bhawáli and a prominent spur separating compartment from Laria Kánta 7; west, well-marked spur separating it from Laria Kánta 9.

Area.—130 acres, of which 20 unproductive.

Configuration and aspect.—The western two-thirds of this compartment occupy the upper three-fourths of the basin of a perennial sot which runs due north into the Bhawáli gadhera. Here the spur between the numerous little feeders of that stream are rounded, but the gradients are everywhere steep, generally exceeding 20° and averaging at least 30°. The ground obviously falls northwards, but many of the slopes forming the sides of the basin look west, north-west, or north-east. The remaining third of the compartment has a uniformly north-easterly aspect, and, with the exception of the extreme top, where the gradients are seldom less than 45°, consists of more or less easy and uniform slopes (15° to 35°), most of which have at one time been under cultivation. The whole compartment is well sheltered by neighbouring higher ground.

Elevation.—Maximum 7,500 feet, minimum 5,600 feet, mean about 6,000 feet.

Soil and underlying rock.—Soil generally sandy, dry, never very deep in the eastern third of the compartment, elsewhere deep, moist and rich in mould along the perennial sot, but becoming shallower, poorer, and drier as we ascend the sides of the bay, until at many points the underlying shales and freely fissured sandstones are left exposed. Fragments of all sizes of those rocks are everywhere largely intermixed with the soil, which is excellent for bánj, rhododendron, and chír according to locality.

Stock.—The immediate neighbourhood of the perennial stream is completely stocked with vigorous bánj and rhododendron forest. In the upper half of the compartment

drained by that stream, this forest ascends almost right up to the crests of the main spurs, becoming sparse (0·3 to 0·6) only in the steeper slopes. Elsewhere the stock (density 0·6 to 0·8) has suffered from the contiguity of the Bhawáli village lands and from former cultivation ; but it is now recovering rapidly, chír already showing well, almost pure along the crests of spurs and mixed chiefly with bánj and rhododendron-coppice elsewhere. The future of this compartment is very promising, if grazing and indiscriminate lopping can be stopped.

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chír ...	12	1,200	480	49	2,940	1,225	294	5,880	3,528	1,965	...	13,755
Oaks ...	469	...	42,210	454	...	18,160	902	...	13,530	3,115	...	12,460
Ayár and broms ...	229	...	8,015	711	...	12,798	2,278	...	13,664	6,959	...	10,938
Sál ...	...	...	...	...	...	...	...	...	...	...	...	...
Sain ...	...	...	...	...	...	...	...	...	...	...	...	...
Cypress ...	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	710	1,200	50,705	1,214	2,940	32,183	3,474	5,880	30,722	12,039	...	37,153

Reproduction.—Excellent at every point where there is room for it, especially on the crests of spurs in respect of chír.

Grazing.—Heavy in the lower half of the compartment ; above that *nil.*

Export lines.—A footpath which can be easily converted into a bridle-road and meets the Dhúni khál-Hinnan forest bridle-road opposite Dhúni khál traverses the compartment midway between the top and bottom.

Laria Kanta 9.

Boundaries.—North, village lands of Dhúni khál and Bhawáli gadhera ; east, prominent spur coming down from Laria Kánta and separating compartment from Laria Kánta 7 and 8 ; south, Laria Kánta ridge separating it from Laria Kánta 2 and 3 ; west, ridge and spur running down from the great Laria Kánta ridge and separating compartment from Laria Kánta 10 and 11.

Area.—242 acres, of which 40 unproductive.

Configuration and aspect.—The compartment consists almost entirely of the basin of a large feeder of the Bhawáli gadhera, about one-fourth of the area on the west being drained by three small raulís forming part of the head-waters of the same gadhera. On the left of the large stream the ground is cut up by deep ravines with steep and often precipitous sides ; on the right of it the channels are not deep and the spurs are rounded. The gradients of the slopes in the lower half of the compartment vary from 25° to 40,° while in the upper half, except below the Laria Kánta ridge, where the ground is precipitious, the average gradient is 20°. The general fall of the ground is, of course, northwards, towards the Bhawáli gadhera, but the sides of the main basin and the numerous spurs between which the various ravines run give rise to secondary westerly and easterly aspects, the former predominating.

Elevation.—Maximum 8,144 feet, minimum 5,800 feet, mean about 7,400 feet.

Soil and underlying rock.—Soil sandy, deep and fairly rich in the main ravines and on the gentle slopes below the Laria Kánta ridge ; elsewhere shallow and even absent, everywhere mixed with fragments of all sizes of the underlying alternating shales and freely-fissured sandstones, which pass into one another by gradual transition.

The crest of the Laria Kánta ridge is composed of the black krol limestone. Soil excellent for bánj and tilonj.

Stock.—On the right of the main stream, the upper part of the compartment and the immediate neighbourhood of the stream are well stocked (density 0·8 to 1·0) with bánj and tilonj of vigorous growth, while elsewhere the ground is dotted (density 0·2 to 0·4) with stunted bánj, rhododendron, and ayár, except on the old cultivation sites near the Bhawáli village, which are well cropped with young bánj and chír. The remainder of the compartment is thickly (density 0·7 to 1·0) covered with alternate belts of chír and bánj and rhododendron forest ; the former occupying the crests of the ridges and spurs, the latter filling the ravines and gullies, and the separation between the two kinds of forest being marked by a more or less blank belt. The bottom of the compartment however, as might be expected in the vicinity of the Bhawáli gadhera, is completely cropped with low, branchy bánj and rhododendron on stools, with a slight sprinkling of chír. This chír is short-boled and much branched, while the bánj is vigorous.

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chír ...	15	1,500	600	35	2,100	875	137	2,740	1,644	908	...	6,356
Oak ...	1,327	...	119,430	1,433	...	57,320	2,266	...	33,960	3,915	...	15,660
Ayár and brons...	410	...	14,350	971	...	17,478	3,003	...	18,018	6,555	...	9,832
Sál ...	...	...	...	...	...	...	...	...	...	...	...	...
Sain ...	...	...	...	...	...	...	...	...	...	...	...	...
Cypress ...	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	1,752	1,500	134,380	2,439	2,100	75,673	5,406	2,740	53,622	11,378	...	31,848

Reproduction.—Mean co-efficient 0·6. It comprises all counted species, especially chír and bánj. With the single exception of chír, young seedlings of which are coming up abundantly in the open ground formerly under cultivation, new reproduction by seed is rare.

Grazing.—Heavy just at bottom of compartment ; elsewhere *nil.*

Export lines.—The Dhúni khál-Hinnan forest bridle-road passes through the north-west extremity of the compartment. The Laria Kánta pic-nic road forms its southern boundary for a few yards.

Laria Kánta 10.

Boundaries.—North and east, prominent ridge separating compartment from Laria Kánta 9 and 11 ; south, Laria Kánta ridge bounding it off from the civil station ; west, the left branch of the Jákh nadi separating it from Jákh 1.

Area.—205 acres, of which 50 unproductive.

Configuration and aspect.—With the exception of a slope of limited extent running down to the last-mentioned stream, this compartment occupies the deep bay, with steep (gradients 35° to 50°) sides formed by the right branch of the Jákh nadi. The westerly and south-westerly slopes fall in even terraces, while the northerly slopes, coming down from the lofty Laria Kánta ridge, are furrowed by deep ravines and gullies and are extemely rugged. The general fall of the ground is, of course, north-westwards.

Elevation.—Maximum 8,144 feet, minimum 5,800 feet, mean about 7,000 feet.

Soil and underlying rock.—A sandy soil. On the south-westerly slopes very shallow ; it is often wanting where the underlying schistose sandstone crops out ; here landslips are frequent. Elsewhere it is often deep, especially on gentle slopes and in ravines and gullies, where also it contains a notable proportion of vegetable mould. The soil is always mixed up with fragments of all sizes of the underlying shales and freely-fissured sandstones, which run into one another and of the black krol limestone which crowns the Laria Kánta ridge. Soil generally excellent for tilonj and banj.

Stock.—The south-westerly slopes are sparsely (0·2 to 0·3) covered with stunted chír mixed with low, bushy banj aud brons. In the rest of the compartment, if we except the steeper slopes and rocky portions which are more or less treeless, and the more open ground at the head of the bay which was formerly under cultivation and contains very sparse tilonj scrub, stock is very variable. The ravines and gullies immediately under the main ridge are densely stocked mainly with tilonj of all ages. Below this the density changes from point to point, and, as we descend, tilonj gets gradually replaced by bánj, till at the bottom of the compartment the latter easily predominates. Rhododendron forms everywhere a notable proportion of the crop. Some of the tilonj trees are of immense size, reaching a girth of from 9 to 12 feet.

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chír ...	49	4,900	1,960	87	5,220	2,175	342	6,840	4,104	461	...	3,227
Oak ...	768	...	69,120	669	...	26,760	939	...	14,085	1,734	...	6,936
Ayar and brons ...	155	...	5,425	313	...	5,634	862	...	5,172	2,986	...	4,479
Sál	...	...	...	...	...	...	...	...	...	...	...	...
Sain	...	...	...	...	...	...	...	...	...	...	...	...
Cypress ...	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	972	4,900	76,505	1,069	5,220	34,569	2,143	6,840	23,361	5,481	...	14,642

Reproduction.—In oak and rhododendron forest the reproduction of tilonj especially and of bánj and rhododendron is excellent (co-efficient 0·5 to 0·8) ; chír seedlings are coming up fairly well in places on the south-westerly slopes.

Grazing.—Nil.

Export lines.—The new district bridle road from Naini Tál to Ránikhet passes through the bottom of the compartment.

Laria Kánta 11.

Boundaries.—North, Bhwáli 12 ; east, ridge separating compartment from Laria Kánta 9 ; south, sharp ridge separating it from Laria Kánta 10 ; west Jákh nadi.

Area.—112 acres, of which 40 unproductive.

Conguration and aspect.—This compartment occupies the funnel-shaped basin formed by several small streams that run north-west into the Jákh nadi. The gradients are very rapid, varying from 35° to 50°, being steepest at the top. The aspect is north-westerly and exposed to the strong winds that blow from that quarter.

Elevation.—Maximum 7,300 feet, minimum 4,700 feet, mean about 6,100 feets.

Soil and underlying rock.—The soil is sandy, full of broken rock of all sizes, often absent in the upper part of the compartment, where the underlying quartzitic sandstones form bare grim crags. This formation alternates with shale, the two rocks after passing into one another by gradual transitions. The friable nature of thee

rocks and the steepness of the slopes have combined to form large landslips which have carried away since 1880 nearly a fifth of the whole compartment. Excellent soil for chír mixed with bánj.

Stock.—At the top and bottom of the compartment and along the ravines and gullies there is bánj and brons forest. At the top the forest is very open (density 0·3), and the trees are stunted and crooked; but in the ravines and gullies the ground is well covered (density 0·5 to 0·8), and the bánj presents well-grown specimens; while elsewhere, where the soil has not been washed away, the stock consists chiefly of tall, vigorous pines, generally interspersed with oak and rhododendron.

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chír ...	77	7,700	3,080	203	12,180	5,075	204	4,080	2,448	328	...	2,296
Oaks ...	160	...	14,400	312	...	12,480	532	..	7,980	739	...	2,956
Ayár and brons ...	14	...	490	107	...	1,926	436	...	2,616	1,274	...	1,911
Sál	...	...	...	...	...	...	...	...	...	...	...	...
Sain	...	...	...	...	...	...	...	...	...	...	...	...
Cypress ...	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	251	7,700	17,970	622	12,180	19,481	1,172	4,080	13,044	2,341	...	7,163

Reproduction.—Mean co-efficient 0·5. In oak forest, where the slope is not too steep, seedlings and young coppice of bánj chiefly are generally abundant under and in the vicinity of seed-bearing trees. Small chír seedlings are coming up well in those places where chír is more or less pure.

Grazing.—Nil.

Export lines.—The old Naini Tál-Rúnikhet district bridle-road runs through the bottom of the compartment along the Jákh nadi, while the new road traverses its middle and thus bisects it.

CHAPTER IV.—BHAW ÁLI BLOCK.

Boundaries.—North and east, the outer boundary of the forest from Ghuna to Tircha Khet, a distance of about six miles; south, a well-defined spur separating the block from the Kuria block; west, the Kuria, Laria Kánta, Jákh, and Budhlákot blocks, and the village lands of Bhungad, Aksára, Bhawáli, Dúni khál, and Jákh.

Enclosed private estates.—About 663 acres in 20 several blocks, the largest of which comprises 296 acres, the smallest 1 acre.

Area.—4,052 acres, of which 777 unproductive.

Number of component compartments.—29.

Configuration and aspect.—This block extends over the spurs and slopes, which come down on each side of the great ridge known at different points under the different names of Kalpokhar Dhár, Ásanguri Dhár, and Hinnan Dánda, and, crossing thence the Bhawáli gadhera, stretches away over the lower ridges and slopes below the great Laria Kánta ridge. The northern half of the block thus looks north and the greater portion of the remaining area east.

Elevation.—Maximum 7,040 feet, minimum 3,200 feet, mean about 5,800 feet.

Soil and underlying rock.—The soil is generally sandy and shallow, but becomes loamy wherever there is a large accumulation of it on the gentler gradients and at and near the foot of slopes. The underlying rock is principally sandstone, generally thin-bedded and breaking up easily, but not unfrequently becoming quartzitic ; shales abound on some of the lower slopes. The soil is generally excellent for chír or bánj, according to the situation and configuration of the ground.

Stock.—Chiefly chír, with belts of bánj, mixed or more or less pure, lining the ravines and depressions and fringing the foot of hills. The chír is generally of excellent growth, although its reproduction is not quite satisfactory, while the bánj is completely at home and is covering the ground well.

The number of trees of the various counted classes is given, compartment by compartment, in the subjoined statement :—

Species.	Diameter-class.	Compartment 1, area 142 acres.		Compartment 2, area 107 acres.		Compartment 3, area 313 acres.		Compartment 4, area 82 acres.		Compartment 5, area 123 acres.	
		Gross number of trees.	Number of trees per acre.	Gross number of trees.	Number of trees per acre.	Gross number of trees.	Number of trees per acre.	Gross number of trees.	Number of trees per acre.	Gross number of trees.	Number of trees per acre.
Chír ...	I.	216	1·52	...	0·00	...	0·00	110	1·34	3	0·02
	II.	855	6·02	242	2·26	842	2·69	462	5·63	374	3·04
	III.	2,117	14·90	975	9·11	3,710	11·86	1,030	12·57	1,879	15·27
	IV.	3,645	25·67	2,463	23·01	6,939	22·17	1,402	17·09	3,350	27·23
Totals ...	...	6,833	48·10	3,680	34·39	11,491	36·71	3,004	36·63	5,606	45·57
Phanyáth ...	I.	...	...	...	...	...	...	...	...	...	...
	II.	...	...	...	...	...	...	...	...	...	...
	III.	...	...	...	...	4	0·01	2	0·02	5	0·04
	IV.	2	0·01	...	...	9	0·02	10	0·12	17	0·13
Totals ...	...	2	0·01	...	...	13	0·04	12	0·14	22	0·17
Bánj ...	I.	27	0·19	80	0·74	136	0·43	15	0·18	51	0·41
	II.	66	0·46	126	1·18	353	1·12	22	0·26	189	1·53
	III.	215	1·51	386	3·60	1,237	3·96	133	1·62	1,047	8·51
	IV.	752	5·29	1,504	14·06	4,085	13·06	377	4·59	2,493	20·26
Totals ...	...	1,060	7·46	2,096	19·59	5,811	18·57	547	6·67	3,780	30·73
Tilonj ...	I.	...	...	...	...	...	...	...	...	...	...
	II.	...	...	...	...	...	...	...	...	...	...
	III.	...	...	...	...	...	...	...	...	...	...
	IV.	...	...	...	...	...	...	...	...	...	...
Totals ...	...	...	...	...	...	...	...	...	...	...	...
Ayár ...	I.	...	...	...	...	...	...	...	...	...	...
	II.	5	0·03	3	0·02	9	0·02	...	...	2	0·01
	III.	18	0·12	29	0·26	131	0·41	4	0·04	40	0·32
	IV.	52	0·36	157	1·46	668	2·13	48	0·58	439	3·57
Totals ...	...	75	0·52	189	1·76	808	2·58	52	0·63	481	3·91
Brous ...	I.	1	0·00	6	0·05	10	0·03	...	...	1	0·00
	II.	5	0·03	35	0·32	97	0·30	...	...	14	0·11
	III.	16	0·11	138	1·29	466	1·48	9	0·10	115	0·93
	IV.	38	0·26	489	4·57	2,146	6·86	29	0·35	683	5·55
Totals ...	...	60	0·42	668	6·24	2,719	8·67	38	0·45	813	6·60
Sain ...	I.	...	...	...	...	...	...	...	...	...	...
	II.	...	...	...	...	...	...	...	...	...	...
	III.	...	...	...	...	...	...	...	...	...	...
	IV.	...	...	...	...	...	...	...	...	...	...
Totals ...	...	...	...	...	...	...	...	...	...	...	...
GRAND TOTALS ...		8,030	56·54	6,633	62·00	20,842	66·58	3,653	44·54	10,702	87·00

Compartment 6, area 238 acres.		*Compartment 7, area 368 acres.*		*Compartment 8, area 115 acres.*		*Compartment 9, area 193 acres.*		*Compartment 10, area 91 acres.*		*Compartment 11, area 157 acres.*		*Compartment 12, area 328 acres.*	
Gross number of trees.	Number of trees per acre.	Gross number of trees.	Number of trees per acre.	Gross number of trees.	Number of trees per acre.	Gross number of trees.	Number of trees per acre.	Gross number of trees.	Number of trees per acre.	Gross number of trees.	Number of trees per acre.	Gross number of trees.	Number of trees per acre.
54	0·22	107	0·29	...	...	304	1·57	14	0·15	77	0·50	301	0·91
320	1·34	484	1·31	...	...	563	2·91	39	0·42	113	0·71	720	2·19
1,434	6·02	1,607	4·37	...	...	1,777	9·20	175	1·92	354	2·25	1,121	3·41
3,103	13·03	5,293	14·38	...	...	3,849	19·94	2,025	22·25	2,083	13·27	9,918	30·23
4,911	20·61	7,491	20·35	...	...	6,493	33·62	2,253	24·75	2,627	16·73	12,060	36·74
...	...	6	0·01	...	...	3	0·01	...	...	...	...	...	...
...	...	13	0·03	...	...	2	0·01	...	...	...	...	...	...
...	...	66	0·18	...	...	11	0·05	...	...	...	...	...	...
3	0·01	262	0·71	...	...	51	0·26	...	...	...	...	...	...
3	0·01	347	0·94	...	...	67	0·34	...	...	...	...	...	...
174	0·73	420	1·14	...	...	123	0·63	87	0·95	31	0·19	142	0·43
339	1·42	749	2·03	...	...	278	1·44	97	1·06	48	0·30	269	0·82
1,326	5·57	2,708	7·36	...	...	1,025	5·31	180	1·98	156	1·00	610	1·86
4,638	19·49	10,913	29·66	...	...	3,639	18·85	756	8·31	942	6·00	1,412	4·30
6,477	27·21	14,790	40·19	...	...	5,065	26·23	1,120	12·30	1,177	7·49	2,438	7·41
...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...
1	0·00	3	0·00	...	...	...	...	3	0·03	...	...	...	...
8	0·03	16	0·04	...	...	...	...	5	0·05	...	...	4	0·01
88	0·37	90	0·24	...	...	21	0·10	31	0·34	1	0·00	11	0·03
310	1·30	766	2·08	...	...	294	1·52	184	2·02	1	0·00	56	0·17
407	1·71	875	2·37	...	...	315	1·62	223	2·45	2	0·01	71	0·21
12	0·05	29	0·08	...	...	...	...	10	0·10	...	...	6	0·01
32	0·16	113	0·30	...	...	4	0·02	31	0·34	...	...	13	0·03
156	0·65	434	1·18	...	...	53	0·28	83	0·92	...	...	48	0·14
801	3·36	2,652	7·20	...	...	148	0·76	305	3·35	...	...	140	0·42
1,001	4·20	3,228	8·77	...	...	205	1·06	429	4·71	...	...	207	0·63
...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...
12,799	53·78	26,731	72·63	...	...	12,145	62·92	4,025	44·21	3,806	24·24	14,771	45·03

Species.	Diameter-class.	Compartment 13, area 124 acres.		Compartment 14, area 232 acres.		Compartment 15, area 120 acres.		Compartment 16, area 92 acres.		Compartment 17, area 135 acres.	
		Gross number of trees.	Number of trees per acre.	Gross number of trees.	Number of trees per acre.	Gross number of trees.	Number of trees per acre.	Gross number of trees.	Number of trees per acre.	Gross number of trees.	Number of trees per acre.
Chír ...	I.	101	0·81	138	0·59	38	0·31	...	...	40	0·30
	II.	374	3·01	870	3·75	204	1·70	46	0·50	276	2·04
	III.	707	5·70	2,206	9·50	450	3·75	203	2·20	1,412	10·46
	IV.	3,424	27·61	3,406	14·68	1,339	11·16	1,448	15·73	3,834	28·40
Totals ...		4,606	37·14	6,620	28·53	2,031	16·92	1,697	18·44	5,562	41·20
Phanyáth ...	I.	...	...	...	...	7	0·05	...	...	...	...
	II.	...	...	...	...	7	0·05	...	...	3	0·02
	III.	...	...	...	...	28	0·23	...	...	4	0·03
	IV.	...	...	...	...	35	0·30	...	...	11	0·08
Totals ...		...	...	...	...	77	0·64	...	...	18	0·13
Bánj ...	I.	46	0·37	119	0·51	184	1·53	117	1·28	156	1·16
	II.	87	0·70	201	0·86	363	3·02	171	1·85	312	2·31
	III.	475	3·82	435	1·87	720	6·00	328	3·57	953	7·05
	IV.	1,462	11·79	614	2·64	1,221	10·18	608	6·60	4,826	35·74
Totals ...		2,070	16·69	1,369	5·89	2,488	20·73	1,224	13·30	6,247	46·27
Tilonj ...	I.	...	...	...	...	...	...	5	0·05	...	...
	II.	..	...	...	...	...	...	0	0·00	...	...
	III.	...	...	...	...	...	...	15	0·16	...	...
	IV.	...	...	...	...	...	...	13	0·14	...	...
Totals ...		...	...	...	...	...	...	33	0·35	...	...
Ayár — ...	I.	...	...	...	...	3	0·02	3	0·03	...	...
	II.	...	...	...	...	39	0·32	22	0·23	8	0·06
	III.	2	0·01	1	...	189	1·57	127	1·38	66	0·49
	IV.	4	0·03	13	0·05	612	5·10	530	5·76	401	2·97
Totals ...		6	0·04	14	0·06	843	7·02	682	7·41	475	3·51
Brons ...	I.	...	...	1	...	95	0·80	6	0·06	13	0·09
	II.	...	...	...	...	326	2·71	60	0·66	49	0·37
	III.	2	0·01	2	0·01	168	1·40	305	3·31	229	1·70
	IV.	4	0·03	3	0·01	1,877	15·64	964	10·48	1,111	8·22
Totals ...		6	0·04	6	0·02	2,466	20·55	1,335	14·51	1,402	10·38
Sain ...	I.	...	...	...	...	...	...	...	...	...	...
	II.	...	...	...	...	...	...	...	...	...	...
	III.	...	...	...	...	...	...	...	...	...	...
	IV.	...	...	...	...	...	...	...	...	...	...
Totals ...		...	...	...	...	...	...	...	...	...	...
GRAND TOTALS ...		6,688	53·93	8,009	34·52	7,905	65·87	4,971	54·03	13,704	10·151

Compartment 18, *area* 88 *acres.*		*Compartment* 19, *area* 237 *acres.*		*Compartment* 20, *area* 162 *acres.*		*Compartment* 21, *area* 65 *acres.*		*Compartment* 22, *area* 106 *acres.*		*Campartment* 23, *area* 120 *acres.*		*Compartment* 24, *area* 193 *acres.*	
Gross number of trees.	Number of trees per acre.	Gross number of trees.	Number of trees per acre.	Gross number of trees.	Number of trees per acre.	Gross number of trees.	Number of trees per acre.	Gross number of trees.	Number of trees per acre.	Gross number of trees.	Number of trees per acre.	Gross number of trees.	Number of trees per acre.
8	0·09	53	0·22	...	...	5	0·08	26	0·24	30	0·25	82	0·42
76	0·86	245	1·03	...	...	16	0·25	73	0·69	167	1·39	532	2·75
261	2·96	864	3·64	184	1·13	29	0·45	138	1·30	427	3·55	1,304	6·75
446	5·07	3,724	15·71	1,389	8·57	168	2·59	394	3·71	354	2·95	1,845	9·56
791	8·98	4,886	20·61	1,573	9·70	218	3·36	631	5·95	978	8·15	3,763	19·49
...	...	1	...	3	0·02	...	...	...	...	...	...	1	0·01
...	...	6	0·02	1	0·01	...	...	..	...	...	...	...	...
...	...	38	0·16	6	0·04	...	...	...	...	...	...	2	0·01
...	...	211	0·89	53	0·32	...	...	...	...	...	...	2	0·01
...	...	256	1·08	63	0·39	...	...	...	...	...	...	5	0·03
114	1·30	262	1·10	49	0·30	49	0·75	42	0·39	14	0·12	232	1·20
174	1·98	509	2·14	144	0·88	127	1·95	122	1·15	70	0·58	348	1·79
254	2·88	1,571	6·62	760	4·69	363	5·58	252	2·37	206	1·71	663	3·43
477	5·42	8,963	37·81	3,070	18·95	872	13·42	1,274	12·01	347	2·89	1,454	7·53
1,019	11·58	11,305	47·70	4,023	24·83	1,411	21·70	1,690	15·94	637	5·30	2,697	13·95
...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	..	...	...	...	...	...	...	...	...	...	..	...	...
4	0·04	4	0·02	...	...	...	...	...	...	...	...	...	...
31	0·35	17	0·07	...	...	...	...	...	...	1	0·01	12	0·06
223	2·53	167	0·70	74	0·45	...	...	9	0·08	4	0·03	104	0·54
1,212	13·78	1,512	6·37	786	4·85	...	...	9	0·08	42	0·35	365	1·89
1,470	16·70	1,700	7·17	860	5·30	...	...	18	0·17	47	0·39	481	2·49
52	0·59	34	0·14	2	0·01	...	...	1	0·01	...	...	17	0·09
154	1·75	149	0·62	...	...	3	0·05	1	0·01	4	0·03	79	0·40
354	4·02	959	4·04	431	2·67	3	0·05	6	0·06	13	0·11	338	1·75
2,490	28·30	5,199	21·93	2,287	14·11	10	0·15	17	0·16	74	0·61	818	4·23
3,050	34·66	6,341	26·73	2,720	16·79	16	0·25	25	0·23	91	0·75	1,252	6·49
...	...	...	...	...	...	...	...	...	...	1	0·01	...	...
...	...	...	...	...	...	...	...	...	...	1	0·01	...	...
...	...	...	...	...	...	...	...	...	...	7	0·06	...	...
...	..	...	...	...	...	...	...	...	...	15	0·13	...	...
...	...	...	...	...	...	...	...	...	...	24	0·20	...	...
6,330	71·93	24,488	103·32	9,239	57·01	1,645	25·31	2,364	22·30	1,777	14·80	8,198	42·48

Species.	Diameter-class.	Compartment 25, area 75 acres.		Compartment 26, area 86 acres.		Compartment 27, area 101 acres.		Compartment 28, area 89 acres.		Compartment 29, area 70 acres.		Entire block, area 4,352 acres.	
		Gross number of trees.	Number of trees per acre.	Gross number of trees.	Number of trees per acre.	Gross number of trees.	Number of trees per acre.	Gross number of trees.	Number of trees per acre.	Gross number of trees.	Number of trees per acre.	Gross number of trees.	Number of trees per acre.
Chír ...	I.	...	...	26	0·30	35	0·34	16	0·18	29	0·41	1,813	0·41
	II.	...	...	167	1·94	291	2·88	63	0·70	98	1·40	8,512	1·96
	III.	462	6·17	219	2·55	841	8·32	265	2·98	227	3·24	26,378	6·07
	IV.	754	10·05	93	1·08	887	8·79	599	6·73	288	4·11	98,462	15·73
Totals ...		1,216	16·21	505	5·87	2,054	20·33	943	10·59	642	9·17	105,165	24·17
Phanyáth ...	I.	1	0·01	...	...	...	...	...	...	...	...	22	...
	II.	1	0·01	...	...	...	...	...	...	...	...	33	...
	III.	1	0·01	4	0·05	...	...	...	...	...	...	171	0·03
	IV.	5	0·07	9	0·10	...	...	...	...	...	...	680	0·15
Totals ...		8	0·10	13	0·15	...	...	...	...	...	...	906	0·8
Bánj ...	I.	68	0·90	29	0·33	210	2·07	197	2·21	63	0·90	3,237	0·74
	II.	84	1·12	149	1·73	309	3·05	348	2·78	136	1·94	6,090	1·40
	III.	490	6·53	565	6·57	770	7·62	638	7·16	405	5·79	18,871	4·33
	IV.	619	8·25	1,235	14·36	1,247	12·34	1,521	17·10	653	9·33	61,974	14·24
Totals ...		1,261	16·81	1,978	23·00	2,536	25·10	2,604	29·25	1,257	17·96	90,172	20·71
Tilonj ...	I.	...	...	...	...	...	...	...	...	...	...	5	...
	II.	...	...	...	...	...	...	...	...	...	...	...	...
	III.	...	...	...	...	...	...	...	...	...	...	15	...
	IV.	...	...	...	...	...	...	...	...	1	0·01	14	...
Totals ...		...	...	...	...	...	...	...	...	1	0·01	34	...
Ayár ...	I.	...	...	...	...	2	0·02	10	0·11	2	0·03	35	...
	II.	3	0·04	...	...	5	0·05	29	0·32	5	0·07	224	0·05
	III.	27	0·36	2	0·02	32	0·31	190	2·13	18	0·26	1,699	0.39
	IV.	192	2·56	59	0·69	152	1·50	933	10·49	87	1·24	9,884	2·04
Totals ...		222	2·96	61	0·70	191	1·89	1,162	13·05	112	1·60	11,842	2·72
Brous ...	I.	6	0·08	...	...	4	0·04	54	0·60	2	0·03	362	0·08
	II.	29	0·39	...	...	9	0·09	144	1·61	7	0·10	1,358	0.31
	III.	223	2·97	...	...	131	1·29	598	6·71	44	0·63	5,324	1·22
	VI.	717	9·56	...	...	559	5·56	1,711	19·22	149	2·13	25,418	5·84
Totals ...		975	13·00	...	...	700	6·98	2,507	28·16	202	2·88	32,462	7·45
Sain ...	I.	...	...	...	...	...	...	...	...	...	...	1	...
	II.	...	...	...	...	...	...	...	...	...	...	1	...
	III.	...	...	...	...	...	...	...	...	...	...	7	...
	IV.	...	...	...	...	...	...	...	...	...	...	15	...
Totals ...		...	...	...	...	...	...	...	...	...	...	24	...
GRAND TOTALS,		3,682	49·09	3,557	29·72	5,481	24·27	7,216	81·07	2,214	31·62	240,605	55·28

Grazing.—Fairly heavy in the northern and southern portions, light or absent elsewhere. Only villagers' cattle are admitted.

Roads.—There are no less than three district bridle-roads in this block. The first, from Naini Tál to Bhim Tál, crosses its southern half; the second, from Naini Tál to Ránikhet, traverses half its length from south to north; while the third flanks its entire length from Ratghát near Ghúna to Dugai. Parallel to this last, just outside the forest and across the Ninglát gád, runs the new Ránikhet-Naini Tál cart-road, which near Shamkhet winds to the west to meet the Naini Tál-Ránibagh cart-road, about 1,000 feet below the Convalescent Depôt. Besides the above, there are several excellent forest roads, the whole forming a very complete network of communications.

Bhawali 1.

Boundaries.—North, ridge separating compartment from Bhawáli 2; east, Ninglát Gadhera and village lands of Dádar, Sirori and Jioli; south and west, watershed line between the Ninglát and Bhawali gadheras, separating compartment from Bhawali 14.

Area—A hundred and forty-two acres, of which 20 unproductive.

Configuration and aspect.—This compartment occupies a shallow basin between the two ridges mentioned above, and is drained by numerous little gullies and ravines eastwards into the Ninglát gadhera. The ground is very rugged and the slopes steep, the minimum gradient being 20° and the mean about 28°. The general aspect is easterly. The slopes are well sheltered on the north and west by the ridges bounding the compartment on these aspects, and on the east by a high mountain rising up to over 7,000 feet on the opposite bank of the Ninglát gadhera.

Elevation.—Maximum 6,400 feet, minimum 4,500 feet, mean about 5,400 feet.

Soil and underlying rock.—The soil is sandy, of very variable depth, though never very deep; wanting on the spurs and ridges; always mixed up with debris of all sizes of the underlying, freely fissured, easily-disintegrating sandstone; good for chír and bánj.

Stock.—Excepting in the gullies and ravines and along the Ninglát gadhera, where small, fairly vigorous, though recently heavily-lopped bánj predominates, mixed with a little brons and ayar and inferior species (density 0·9), the stock, with an average density of 0·6, consists chiefly of chír, many of the trees mature, but short-boled and branchy, owing to the adverse conditions (chiefly fires) they had to struggle against before conservation was begun. Some recent fellings have been made.

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chír ...	216	21,600	8,640	855	51,300	21,375	2,117	42,340	25,404	3,645	...	25,515
Oaks ...	27	...	2,430	66	...	2,640	215	...	3,225	754	...	3,016
Ayár and brons ...	1	...	35	10	...	180	34	...	204	90	...	135
Sál ...	...	...	...	...	...	...	...	...	...	...	...	...
Sain ...	...	...	...	...	...	...	...	...	...	...	...	...
Cypress ...	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	244	21,600	11,105	931	51,300	24,195	2,366	42,340	28,833	1,489	...	28,666

Reproduction.—In the oak patches there is little room for new reproduction, young bánj coppice having installed itself in most places where the cover was not too

thick, and also in the small plots of abandoned cultivation, especially along the edges of the terraces. In chír forest reproduction is very backward, only a few scattered seedlings having established themselves under the numerous small gaps in the leaf canopy.

Grazing.—Severe in the vicinity of the bordering cultivation.

Export lines.—The Ránibagh-Khairna district bridle-road runs along the lower boundary of the compartment.

Bhawali 2.

Boundaries.—North, ridge separating compartment from Bhawali 3; east, Mandiál khet and Ninglát gadhera; south, ridge separating compartment from Bhawali 1; west, ridge separating it from Bhawali 3 and 14.

Area.—One hundred and eight acres, of which 15 unproductive.

Configuration and aspect.—The compartment is situated on a rugged slope channelled by several watercourses running eastwards into the Ninglát gadhera, one of them forming a ravine coming down from the watershed line itself. The gradients just below that line for about a fourth of the length of the compartment are easy, seldom exceeding 15°. Below that they become very steep, ranging from 25° to 40°. The aspect is easterly. The compartment is completely sheltered on the east and west.

Elevation.—Maximum 6,533 feet, minimum 4,500 feet, mean about 5,600 feet.

Soil and underlying rock.—As in Bhawali 1, but rather deeper and richer; moreover, the sandstone here becomes sometimes quartzitic. Good soil for chír and bánj.

Stock.—Except along the gullies and ravines at the lower end of the compartment and on abandoned cultivation sites where bánj of vigorous growth predominates (density 0·6), healthy and promising chír, but short-boled and branchy, by reason of former adverse conditions and chiefly in the large pole stage, forms the principal tree, with a density of about 0·8. As we ascend we find bánj associated with the pine in increasing proportion, but the density decreases to 0·5, until on the easy slopes at the top, which were once all under cultivation, the forest becomes very open (0·2 to 0·3).

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chír ...	...	...	...	242	14,520	6,050	975	19,500	11,700	2,463	...	17,241
Oaks ...	80	...	7,200	126	...	5,042	386	...	5,790	1,504	...	6,016
Ayar and brons ...	6	...	210	38	...	684	167	...	1,002	646	...	969
Sál ...	...	...	...	...	...	...	...	...	...	...	...	...
Sain ...	...	...	...	...	...	...	...	...	...	...	...	...
Cypress ...	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	86	...	7,410	406	14,520	11,774	1,528	19,500	18,492	4,613	...	24,226

Reproduction.—In the bánj portions we have chiefly young coppice (co-efficient of completeness, 0·4) and very few new seedlings. In the chír portions the gaps contain a good show of seedlings, but reproduction is still very backward (0·1) in the old cultivation sites at the top, owing to fewness of seed-bearers, and probably also to the ravages of annual fires, which have only recently been stopped.

Grazing—Nil.

Export lines.—The bottom of this compartment is traversed by the Dhúni Khali Hinnan bridle-road close to its eastern boundary.

Bhawali 3.

Boundaries.—North, ridge separating compartment from Bhawali 4 and 5; east Ninglát gadhera and village lands of Ghát, Tallaban, and Mandiál khet; south, ridge separating compartment from Bhawali 2; west, Hinnan ridge separating it from Bhawali 6 and 14.

Enclosed private lands.

Náha	14 acres.
Gharát	6·3 „

Area.—Three hundred and seventeen acres, of which 45 unproductive.

Configuration and aspect.—This compartment comprises the drainage area of a single large much-branched stream coming down from the Hinnan watershed, and of three or four very small ones. All these streams are dry except during the heavy rains. The ground is generally rugged and steep (25° to 45°) with, nevertheless, rounded spurs and shallow drainage channels, except just below the Hinnan ridge, where about 50 acres consist of easy slopes, which were formerly under cultivation like the adjoining upper portion of Bhawali 2. The general aspect is north-easterly, but the minor slopes occasionally look north and (more rarely) south.

Elevation.—Maximum 6,600 feet, minimum 4,200 feet, mean about 5,600 feet.

Soil and underlying rock.—As in Bhawali 2. The proportion of quartzitic sandstone is however larger. The slopes immediately above Náha are slipping down. Excellent soil for chír.

Stock.—Excepting in the ravines and gullies and on or near former cultivation, where bánj in company with brons and ayar, nearly all low, mis-shapen, branchy trees (the result of previous ill-treatment) predominates (density 0·7 to 0·9), the stock consists (density from 0·6 to 1·0) mainly, and in many places purely, of tall, well-shaped, vigorous chír, nearly all middle-aged, the older trees running up to 100 feet and upwards in height. The old cultivation site at the top of the compartment is, however, very bare (0·3). Fellings on a large scale for timber have just been completed throughout the compartment.

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chír	...	...	...	842	50,520	21,050	3,710	74.200	44,520	6,939	...	48,573
Oaks	136	...	12,240	353	...	14,120	1,241	...	18,610	4,094	...	16,376
Ayar and brons ...	10	...	350	106	...	1,908	597	...	3,580	2,814	...	4,221
Sál	...	...	...	...	...	...	...	...	...	...	...	...
Sain	...	...	...	...	...	...	...	...	...	...	...	...
Cypress ...	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	146	...	12,590	1,301	50,520	37,078	5,548	74,200	66,717	13,847	...	69,170

Reproduction.—Saplings and unclassed poles of chír and bánj are numerous, those of the latter standing on stools and showing the effects of severe previous lopping and fires. As regards younger advance growth in the old cultivation site just

below the Hinnan ridge the coefficient of chír and bánj combined averages about 0·3; this unsatisfactory condition being no doubt due to paucity of seed-bearers and the exposed nature of the locality. Elsewhere, in the chír portions, seedlings of that species are rapidly establishing themselves, wherever there is a sufficient opening between the crowns of the trees above. New reproduction of bánj is rare, the steepness of the slopes and the hardness of the surface soil being opposed to it.

Grazing.—Nil.

Export lines.—The Dhúni Khól-Hinnan bridle-road traverses the lower half of the compartment, and the Ránibágh-Khairna road runs along its lower boundary.

Bhawali 4.

Boundaries.—North, Ninglát gadhera and private lands of Bhumka and Ghát; east and south, small ridge separating compartment from Bhawali 3; west, prominent ridge separating it from Bhawali 5.

Area.—Eighty-two acres, of which 15 unproductive.

Configuration and aspect.—The ground is extremely steep and rugged. The middle of the compartment consists of the deep hollow basin of a watercourse coming down from the top of the compartment northward into the Ninglát gadhera. The rest of the compartment is furrowed with numerous short shallow ravines, all running directly north into the Ninglát gadhera. The aspect is generally northerly. The mean gradient of the slopes is about 35°.

Elevation.—Maximum 5,500 feet, minimum 3,950 feet, mean about 4,650 feet.

Soil and underlying rock.—Soil sandy, of very variable depth, though never very deep, resting on sandstones which are for the greater part soft and loosely bedded and not unfrequently become even schistose. In many places they are quartzitic. In the lower half of the compartment the rock often crops out. Soil excellent for chír.

Stock.—The deeper ravines and banks of the Ninglat gadhera contain coppice bánj, generally of small girth, low and badly grown and averaging a density of about 0·7. Otherwise the stock consists almost purely of chír of vigorous growth, although the older trees, owing to former ill-usage, are comparatively short (90 feet) and branchy. The upper half of the compartment is well clothed (0·7 to 1·0) mainly with young trees up to 3rd class size. In the other half the stock is much more open (0·4 to 0·6), being even absent in places, and middle-aged trees predominate. The spurs are obviously the best covered portions. Heavy fellings of chír have been made since 1881.

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chír	110	11,000	4,400	462	27,720	11,550	1,030	20,600	12,360	1,402	...	9,814
Oaks	15	...	1,350	22	...	880	135	...	2,025	387	...	1,548
Ayar and brons ...	...	...	...	...	...	...	13	...	78	77	...	115
Sál	...	...	...	...	...	...	...	...	...	...	...	...
Sain	...	...	...	...	...	...	...	...	...	...	...	...
Cypress ...	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	125	11,000	5,750	484	27,720	12,430	1,178	20,600	14,463	1,866	...	11,477

Reproduction.—Saplings and unclassed poles of chír are numerous everywhere, especially in the upper half of the compartment, as also of bánj on stools in the

ravines and along the Niglát. Young seedlings of chír are slowly but steadily establishing themselves in all open spaces.

Grazing.—Nil.

Export lines.—The Ránikhet-Khairna bridle-road runs along the Niglát just inside the compartment and the bridle-path branching off towards Niglát from the Dhúni Khál-Hinnan bridle-road traverses the compartment from east to west, while the narrow bridle-path which meets this last from the Hinnan rest-house runs across two-thirds of its length.

Bhawali 5.

Boundaries.—North, Niglát gadhera ; east and south, prominent ridge separating compartment from Bhawali 3 and 4 ; west, prominent ridge separating it from Bhawali 6.

Area.—A hundred and twenty-four acres, of which 25 unproductive.

Configuration and aspect.—This compartment comprises the deep broad basin of a much-branched watercourse which runs due south into the Niglát gadhera. The ground is generally very rugged, and the gradients vary extremely from slopes of 18,° fit for cultivation, to steep descents of 40° and upwards. The two main branches of the watercourse form two long and deep glens running through nearly the whole length of the compartment. The general aspect is, of course, northerly, but the sides of the bay and minor slopes, owing to sinuosities of contour, look more or less east or west.

Elevation.—Maximum 6,000 feet, minimum 3,800 feet, mean about 5,000 feet.

Soil and underlying rock.—Soil silicious, deep ; composed of fine particles and containing a large proportion of humus on the gentle slopes, most of which are the sites of old cultivation (about one-third of the compartment) excellent for bánj ; elsewhere never deep, with little or no mould, excellent for chír. The underlying rock is, as usual, freely fissured sandstone, generally disintegrating with ease or a loosely cemented conglomerate. Debris of all sizes of both rocks strew the ground and are mixed up with the soil.

Stock.—On the abandoned cultivation sites and in the ravines and gullies the forest (density 0·8 to 1·0) consists of bánj almost pure, of very vigorous growth, but severely damaged by fires and constant former lopping. On the cultivation sites, as may be expected, the trees stand along the edges of the terraces. A few phanyáth also are found along the Ninglát. Elsewhere the stock (density 0·6 to 0·9) is composed almost exclusively of vigorous chír, a sprinkling of low coppice-grown bánj being associated with it only in the upper portion of the compartment. The older trees are comparatively short, the result of bad treatment and too open growth during the period that the adjoining easy slopes were under cultivation. Heavy cuttings of chír have been made since 1881.

Summary of valuation.

Species.	Class. I.			Class II.			Class III.			Class. IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chír ...	3	300	120	374	22,440	9,350	1,879	37,580	22,548	3,350	...	26,450
Oaks ...	51	...	4,590	189	...	7,560	1,052	...	15,780	2,510	...	10,040
Ayar and brons ...	1	...	35	16	...	288	155	...	930	1,122	...	1,683
Sál ...	...	...	...	...	...	...	...	...	...	...	...	...
Sain ...	...	...	...	...	...	...	...	...	...	...	...	...
Cypress ...	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	55	300	4,745	579	22,440	17,198	3,086	37,580	39,258	6,982	...	38,173

Reproduction.—Saplings and unclassed poles of chír and bánj are numerous, but, owing to the great density of the crop, there is little room for new reproduction, although, the old cultivation terraces excepted, seedlings of chír chiefly and of bánj are rapidly establishing themselves wherever sufficient light reaches the ground. On the cultivation terraces the soil seems to be too hard to offer a favourable seed-bed for acorns, and bánj seedlings are hence very few and far between.

Grazing.—Moderate, but sufficient to trample the surface of the ground hard and unfit it for the reception of seed.

Export lines.—The Dhúni Khál-Hinnan forest bridle-road traverses the upper end of the compartment and the forest bridle-path from Ninglát its middle from east to west, while the Ránibágh-Khairna bridle-road runs along the left bank of the Ninglát gadhera.

Bhawali 6.

Boundaries.—North, Ninglát gadhera, forming outer boundary of the forest; east, prominent spur separating compartment from Bhawáli 5; south, watershed line between Ninglát and Bhawali gadheras separating it from Bhawali 14; west, very prominent spur separating it from Bhawali 7.

Area.—Two hundred and forty acres, of which 40 unproductive.

Configuration and aspect.—This compartment occupies the whole of the long, deep bay formed by a large feeder of the Ninglát gadhera. The head of this bay (one-third of compartment) consists of very rugged steep (minimum gradient 35°) and even precipitous ground. Below this the ground descends towards the stream by slopes, as a rule, sufficiently easy (15° to 30°) to have permitted of terrace cultivation in former years. Just near the Ninglát the contours again become very irregular and broken. The ground falls rapidly from north to south, and thus produces a general southerly aspect, although the slopes forming the sides of the bay look respectively east and west.

Elevation.—Maximum 6,528 feet, minimum 3,670 feet, mean about 5,100 feet.

Soil and underlying rock.—Silicious, usually deep, except on the sharp ridges; excellent for chír and bánj, pure or in mixture, resting on freely fissured often schistose and easily-disintegrating, occasionally quartiztic sandstone; exposed to landslips.

Stock.—The steep slopes at the head of the bay above the Dhúni Khál-Hinnan bridle-road, with the exception of a small portion at the western extremity, are clothed (density 0·7 to 0·9) mainly with vigorous chír. At the lower end of the compartment also, where the forest is very dense, chír predominates, being all but pure on the westerly slopes of the bay and associated with a fair sprinkling of bánj only on the opposite side of the sot. The whole of the middle of the compartment and the western extremity, already referred to, of the portion above the road contain principally bánj forest. Excluding the old cultivation sites here, forming about one-eighth of the total area of the compartment, the density of this oak forest varies from 0·7 to 1·0. Some brons and, in much smaller portion, ayár are associated with the bánj, and this chiefly along the gullies and ravines, and there is a sprinkling of chír in many places. The bánj is of vigorous growth, but stunted, crooked and branchy, and very unsound, the result of constant lopping and pollarding in former times. Most of the cultivation terraces are still very bare, containing only sparse chír and bánj with a density of scarcely 0·1.

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chír ...	54	5,400	2,160	320	19,200	8,000	1,434	28,680	17,248	3,103	...	21,721
Oak ...	177	...	15,930	339	...	13,560	1,326	...	19,890	4,638	...	18,552
Ayar and brons...	13	...	455	40	...	720	244	...	1,464	1,111	...	1,666
Sál ...	...	...	...	...	...	...	...	...	...	...	...	...
Sain ...	...	...	...	...	...	...	...	...	...	...	...	...
Cypress ...	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	244	5,400	18,545	699	19,200	22,280	3,004	28,680	38,602	8,852	...	41,939

Reproduction.—In the chír portions, seedlings are coming up well in all open places, and there is a considerable proportion of saplings and unclassed poles. This older advance growth is also abundant in the well-stocked oak portions, but new seedlings are rare. The abandoned cultivation sites, bearing a close crop of grass, are plentifully dotted over with bánj bushes, which are kept down by the heavy grazing, but, in spite of this grazing, young chír is slowly but steadily establishing itself.

Grazing.—Heavy in all open places.

Export lines.—The Dhuni Khal-Hinnan bridle-road traverses the upper portion of the compartment from east to west, and the bridle-path from Ninglát, its middle, from north-east to south-west, while the Ránibagh-Khairna district bridle-road runs along the boundary parallel to the Ninglát gadhera.

Bhawali 7.

Boundaries.—North, the Ninglát gadhera (being the outer boundary of the forest) ; east, a prominent ridge separating compartment from Bhawali 6 ; south, the Asanguri Dhar (main watershed line) separating it from Bhawali 13 ; west, village lands of Chak Bhawali, Pádli and Chorsa and Bhawáli 8.

Enclosed private lands.

Bisoda-ki-Sar	3 acres.
Chapar-ki-Sar	10 „

Area.—Three hundred and seventy-two acres, of which 50 unproductive.

Configuration and aspect.—This compartment occupies the whole of the funnel-shaped basin of an important much-branched feeder of the Ninglát gadhera. The stem portion of the funnel (a deep ravine), and that just above it, consists of steep (35° to 50°) slopes exposed to large landslips. Above this, where the bowl of the funnel spreads out, the northerly and westerly slopes (about half the compartment) are for the most part easy (gradient 15° to 25°), and comprise cultivation terraces now abandoned. The west face of the half bowl has, however, an average gradient of 35°. The ground falls from south to north 3,300 feet in a length of 8,000 feet.

Elevation.—Maximum 6,916 feet, minimum 3,600 feet, mean about 5,100 feet.

Soil and underlying rock.—Soil sandy, of very variable depth according to gradient of slope and raviny or other nature of the ground, always containing fragments of all sizes of the underlying shale and sandstone, the latter of which passes through every gradation from schists to quartzites ; excellent for chír and bánj.

Stock.—The stock is very variable. Speaking generally, bánj, frequently of fine growth, occupies almost exclusively the ravines (density 0·8) and the old cultivation sites (density 0·3 to 0·6), where, as is natural to expect, they are growing on the

edges of the terraces. On the northerly slopes under the main watershed lines, bánj and brons occupy the ground in the proportion of about 5 to 2 and aggregate a density of from 0·5 to 0·9. Elsewhere, mainly the ridges and steeper slopes, short-boled, much-branched chír, bearing traces of former severe jungle fires and ill-treatment, is either the predominant or sole tree (density 0·3 to 0·6).

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees	Cubic feet of timber.	Maunds of fuel.	Number of trees	Cubic feet of timber.	Maunds of fuel.
Chír ...	107	10,700	4,680	484	29,040	12,100	1,607	32,140	19,284	5,293	...	37,051
Oaks ...	426	...	38,340	762	...	30,480	2,779	...	41,685	11,175	...	44,700
Ayar and brons...	32	...	1,120	129	...	2,322	524	...	3,144	3,418	...	5,127
Sál ...	...	...	...	...	...	...	...	...	...	...	...	...
Sain ...	...	...	...	...	...	...	...	...	...	...	...	...
Cypress ...	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	565	10,700	44,140	1,375	29,040	44,902	4,910	32,140	64,113	19,886	...	86,878

Reproduction.—Excluding old cultivation sites, where seed-bearers are deficient and the mean coefficient of reproduction is only 0·2, unclassed poles and saplings on stools and small coppice of bánj, as also brons coppice in the upper portion of the compartment, are abundant (mean coefficient 0·6). The reproduction of chír is everywhere backward (coefficient 0·2).

Grazing.—Heavy nearly everywhere in the upper part of the compartment below the Dhuni Khal-Hinnan road.

Export lines.—The Dhuni Khal-Hinnan forest bridle-road runs through the upper portion of the compartment and the Ránibagh-Khairna district bridle-road follows the Ninglat below.

Bhawali 8.

Area.—A hundred and sixteen acres, of which 70, including about 20 in the bed of the Jakh nadi, unproductive.

This compartment comprises, besides a small outlying strip wedged into the village lands of Padli, the bare or ill-stocked ground jammed in between the village lands of Ghuna on one side and the Jakh and Ninglát nadis on the other. On the Ninglát side the slopes are mostly precipitous, and are cut through their whole length (about one mile) by the new Bhim Tal-Khairna district road. Elsewhere the slopes are nearly always gentle, but heavy grazing and proximity of cultivation will never allow the present wretched scrub, consisting mainly of oaks and inferior moisture-loving species with a few moderately good pines along the ridge, to improve.

Bhawali 9.

Boundaries.—North, village lands of Ratghát, Jakh nadi, a rauli and village lands of Ghuna separating compartment from Bhawali 8; east, village lands of Ghuna, an isolated strip of Bhawali 8, and village lands of Padli; south, Bhawali 7; west, village lands of Chorsa and Kamalta, and prominent ridge separating compartment from Bhawali 11.

Enclosed private land.—A small field belonging to Padli, a fraction of an acre.

Area.—A hundred and ninety-five acres, of which 35 unproductive.

Configuration and aspect.—Three-fourths of the compartment occupy the long, deep, narrow, rugged basin of a feeder of the Jakh nadi. The gradients in this

basin generally vary from 25° to scarps, and the aspect is mainly north-easterly. The remaining fourth is situated on the very steep north-westerly slopes overhanging the same river opposite Kaphaita. Numerous small landslips have occurred.

Elevation.—Maximum 5,600 feet, minimum 3,300 feet, mean 4,200 feet.

Soil and underlying rock.—Soil silicious, of very variable depth, frequently very deep, full of humus in the hollows on many of the gentler slopes, overlying freely fissured, often schistose, sometimes quartzitic sandstone, fragments of all sizes of which are mixed with or strewn over the soil ; excellent for chír and bánj.

Stock.—Both banks of the central sot and the slopes that overhang it on the right are densely (coefficient 0·8 to 1·0) covered with bánj mixed with species that affect low and moist situations. The bánj is very vigorous, but all sprung from stool, and much of it fringes the edges of old cultivation terraces. Elsewhere, except in the gullies, which are filled with oak (density 0·6 to 0·8), the stock consists almost purely of chír with a density varying from 0·4 to 1·0, the mean being 0·6. The pines are vigorous and of very fair size, considering the unfavourable conditions under which they have grown in the immediate proximity of cultivation.

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chír ...	304	30,400	12,160	563	33,780	14,075	1,777	33,540	21,324	3,849	...	26,943
Oaks ...	126	...	11,340	280	...	11,200	1,036	...	15,540	3,690	...	14,760
Ayar and brons ...	...	...	...	4	...	72	74	...	444	442	...	663
Sál ...	...	...	...	...	...	...	...	...	...	...	...	...
Sain ...	...	...	...	...	...	...	...	...	...	...	..	...
Cypress ...	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	430	30,400	23,500	847	33,780	25,347	2,887	33,540	37,308	7,981	...	42,366

Reproduction.—Numerous clumps of saplings and unclassed poles fill up, or are in the way of filling up, the gaps between the counted trees in oak forest, and there is thus little or no room for any new reproduction by seed. In chír forest, besides a goodly proportion of saplings and unclassed poles, young seedlings are coming up in fair numbers in the gaps where the slopes are too steep for cattle.

Grazing.—Heavy in all places accessible to cattle and where there is any growth of grass.

Export lines.—The new Naini Tal-Ránikhet bridle-road traverses three-fourths of the length of the compartment, while the old road runs along the right bank of the Jukh nadi.

Bhawali 10.

Boundaries.—North, footpath separating compartment from Bhawali 11 ; east, village lands of Chorsa and Bhawali 7 ; south and west, prominent ridge separating compartment from Bhawali 12.

Area.—Ninety-one acres, of which 10 unproductive.

Configuration and aspect.—This compartment forms a sort of long, oblong, shallow, rugged, skew funnel ending off, just above the Dhuni Khal-Hinnan bridle-road, in a uniform steep slope of about 35°. The gradients below the road vary from 25° to 40°. The aspect is nearly entirely northerly, only the lesser side of the funnel looking west.

Elevation.—Maximum 6,182 feet, minimum 5,000 feet, mean about 6,000 feet.

Soil and underlying rock.—Soil silicious, of very variable depth, never very deep or entirely absent, containing fragments of all sizes of the underlying freely-fissured, quartzitic sandstone, with shale here and there. Excellent soil for chír.

Stock.—The stock (average density above the new Naini Tal-Ranikhet bridle-road (0·7, below 0·5) consists chiefly of young vigorous chír mixed with bánj of strong growth, but all from the stool. The proportion of brons becomes noticeable in the upper part of the compartment.

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chír ...	14	1,400	560	39	2,340	925	175	3,500	2,100	2,025	...	14,175
Oaks ...	87	...	7,830	97	...	3,880	180	...	2,700	756	...	3,024
Ayar and brons ...	13	...	455	36	...	648	114	...	684	489	...	733
Sál ...	...	...	...	...	...	...	...	...	...	...	...	...
Sain ...	...	...	...	...	...	...	...	...	...	...	...	...
Cypress ...	...	...	...	...	...	..	...	...	...	...	...	...
Total ...	114	1,400	8,845	172	2,340	5,453	469	3,500	5,484	3,270	...	17,932

Reproduction.—Excellent (coefficient 0·8), chiefly bánj and chír in all stages of developement.

Grazing.—*Nil.*

Export lines.—The Naini Tal-Ránikhet district and the Dhuni Khal-Hiunan forest bridle-roads run parallel to, and within 200 yards of, one another through the middle of the compartment.

Bhawali 11.

Boundaries.—North, village lands of Kamalta, and a prominent ridge separating compartment from Bhawali 9; east, village lands of Chorsa; south, footpath separating compartment from Bhawali 10; west, Jakh nadi and a prominent ridge separating compartment from Bhawali 12.

Area.—A hundred and fifty-eight acres, of which 40 unproductive.

Configuration and aspect.—This compartment occupies a shallow bay going up from the Jakh nadi to Chorsa and drained by several gullies and small ravines. About 30 acres adjoining Chorsa consist of rolling ridges with easy gradients (10° to 20°), otherwise the slopes are steep (25° to 40°) and occasionally precipitous. The land has slipped in several places. The general aspect is north-west. The China ridge and outspurs protect on the west the whole of the compartment with the exception of its northern extremity, which is exposed to the full brunt of the wind rushing down the Tikri nadi gorge.

Elevation.—Maximum 5,000 feet, minimum 3,500 feet, mean about 4,200 feet.

Soil and underlying rock.—Silicious, shallow, except on the open ground just below Chorsa, exposing in many places the underlying hard and sometimes the quartzitic sandstone, fragments of which of all sizes strew the ground. Soil good for chír.

Stock.—The open ground just below Chorsa and the ravines and gullies (in all about one-third of the compartment) are stocked with stunted bánj mixed with a few individuals of other species (density 0·3 to 0·5). The very steep slope in the south

of the compartment is almost bare but for a few miserable bánj. Elsewhere, more or less pure chír is to be met with growing far apart (density 0·2 to 0·3), but displaying much vigour and attaining at least average dimensions.

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chír ...	77	7,700	3,080	113	6,780	2,825	354	7,080	4,248	2,083	...	14,581
Oaks ...	31	...	2,790	48	...	1,920	156	...	2,340	942	...	3,768
Ayár and broua ...	...	...	...	...	...	...	1	...	6	1	...	1
Sál ...	...	...	...	...	...	...	...	...	...	...	...	...
Sain ...	...	...	...	...	...	...	...	...	...	...	...	...
Cypress ...	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	108	7,700	5,870	161	6,780	4,745	511	7,080	6,594	3,026	...	18,350

Reproduction.—In the chír portions seedlings are producing themselves abundantly (coefficient 0·5 to 0·7). In the bánj localities there is a good deal of young coppice coming up, but scarcely any new seedlings.

Grazing.—Heavy in the open ground just below Chorsa, otherwise the slopes are too steep for cattle.

Export lines.—The old Naini Tal-Ránikhet district bridle-road cuts through the north-eastern corner of the compartment, but practically the compartment is, for the present at least, quite inaccessible.

Bhawali 12.

Boundaries.—North and east, two ridges separating compartment from Bhawáli 10 and 11 and 13 respectively, and village lands of Dhúni Khál; south and west, Laria Kánta 11, and Jákh nadi separating compartment from Jákh 6 and Jákh village lands

Enclosed private lands.—A detached field belonging to Jákh, area 1 acre.

Area.—Three hundred and thirty-two acres, of which 50 unproductive.

Configuration and aspect.—The upper third of the compartment, bounded by a line running parallel to and below the new Naini Tal-Ránikhet bridle-road, consists of fairly easy gradients (15° to 28°) and rounded contours. The rest of the compartment comprises generally steep slopes cut up by mostly shallow ravines and gullies running down to the Jákh nadi. The aspect is westerly.

Elevation.—Maximum 6,812 feet, minimum 4,000 feet, mean about 5,800 feet.

Soil and underlying rock.—Soil silicious, fairly deep and even deep in the upper third of the compartment; elsewhere generally shallow, in many places entirely absent, having been carried away in landslips or by heavy rains. The underlying rock is alternating shale and a freely-fissured sandstone, generally schistose, not unfrequently quartzitic, fragments of all sizes of it being mixed up with or strewing the soil which is excellent for chír generally and, in many places, also for bánj.

Stock.—Along the Jákh nadi and the deeper ravines and gullies and towards the top of the compartment (density 0·4 to 0·7) bánj, generally of low bushy growth, the result of former lopping and pollarding, predominates. Otherwise the stock consists almost purely of young chír covering the ground well in most places (density 0·6 to 1·0). Small blanks are interspersed everywhere in recently cultivated areas or where the rock is exposed. A small area of more or less gently-sloping ground, just below where the old Naini Tal-Ránikhet bridle-road enters the compartment, contains magnificent

specimens of old chír, some of them running up to 120 feet and measuring 7 to 9 feet in girth at breast-height.

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chír ...	301	30,100	12,040	720	43,200	18,000	1,121	22,420	13,452	9,918	...	69,426
Oaks ...	142	...	12,780	269	...	10,760	610	...	9,150	1,412	...	5,648
Ayár and brons ...	6	...	210	17	...	306	59	...	354	196	...	294
Sál	...	...	...	...	...	...	...	...	...	...	...	...
Sain	...	...	...	...	...	...	...	...	...	...	...	...
Cypress ...	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	49	30,100	25,030	1,006	43,200	29,066	1,790	22,420	22,956	11,526	...	75,368

Reproduction.—There is very little recent bánj reproduction, but saplings and low coppice of it are abundant, especially on the edges of old cultivation terraces where seed-bearing trees have been spared. The reproduction of chír is nearly everywhere excellent from the one-year old seedling to the tall vigorous pole just small enough not to enter the lowest diameter class (coefficient 0·3 to 0·5).

Grazing.—Nil.

Export lines.—The old Naini Tál-Ránikhet district bridle-road runs through the foot of the compartment along the Jákh nadi, while the new road between those towns traverses the upper part of the compartment.

Bhawáli 13.

Boundaries.—North, ridge and spur separating compartment from Bhawáli 7, 10, and 12; east Dhúni Khál-Hinman forest bridle-road and a rauli separating it from Bhawáli 14; south, village lands of Bhawáli and Dhuni Khál, and Bhawáli gadhera separating compartment from Laria Kánta 8 and 9; west, village lands of Dhúni Khál.

Area.—A hundred and twenty-five acres, of which 25 unproductive.

Configuration and aspect.—This compartment occupies the southerly and south-westerly slopes overhanging the Bhawáli gadhera above Dhúni Khál and Bhawáli. The western portion just above Dhúni Khál (about one-eighth of total area), possessing a southerly aspect, has more or less easy gradients (18° to 35°), while the rest of the compartment consists of very steep (30° to 50°) and more or less rugged slopes, prone to slip down. The wind evidently rushes with great fury down the gorge in which this compartment is situated.

Elevation.—Maximum 6,812 feet, minimum 5,650 feet, mean about 6,700 feet.

Soil and underlying rock.—Soil sandy, dry, poor; deep above Dhúni Khál; elsewhere shallow and even absent, exposing the underlying schistose and quartzitic sandstone. Excellent for chír where the gradient is favorable.

Stock.—The slopes above Dhúni Khál, which were at one time under cultivation, are densely (coefficient 1·0) stocked with chír poles; elsewhere the stock is extremely open (0·2), consisting of scattered chír of average growth and stunted bushy bánj.

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chír	101	10,100	4,040	374	22,440	9,350	707	14,140	8,484	3,424	...	23,968
Oaks	46	...	4,140	87	..	3,480	475	...	7,125	1,462	...	5,868
Ayar and brons ...	...	...	...	...	...	...	4	...	24	8	...	12
Sál	...	...	...	...	...	...	...	...	...	...	...	...
Sain	...	...	...	...	...	...	...	...	...	...	...	...
Cypress ...	...	...	...	...	...	...	...	...	...	...	...	...
Total ..	147	10,100	8,180	461	22,440	12,830	1,186	14,140	15,633	4,894	...	29,848

Reproduction.—In the good stretch of chír poles there is no room for new seedlings. In the rest of the compartment chír is reproducing itself in patches containing seedlings and saplings of various ages, but few and far between. A fairly close low coppice of bánj, lopped or browsed down every year, fringes the boundary at the south-east extremity.

Grazing.—Heavy just at the south-east corner ; otherwise *nil*, owing to the steepness and bareness of the slopes.

Export lines.—The Dhuni Khál-Hinnan forest bridle-road runs parallel to the lower edge of the compartment, chiefly inside it, along its whole length.

Bhawali 14.

Boundaries.—North, the Hinnan ridge and one of its offshoots, Asanguri Dhár, separating compartment from Bhawáli 2, 3, 6, and 7 ; east, a spur running down to the junction of the Bhawáli and Ninglát gadheras and separating it from Bhawáli 1 ; south, village lands of Sirori Chhoti, Sela and Jioli khet, and the Bhawáli gadhera ; west, small gully separating compartment from Bhawáli 13.

Area.—Two hundred and thirty-six acres, of which 40 unproductive.

Configuration and aspect.—This compartment occupies the very steep south-westerly slopes running down from the Hinnan ridge to the Bhawáli gadhera just below the village of Bhawáli. The average gradient is about 350, but a great many slopes are almost precipitous.

Elevation.—Maximum 6,600 feet, minimum 5,750 feet, mean about 5,900 feet.

Soil and underlying rock.—Soil sandy, of very variable depth, though never very deep, always wanting along the main ridge and in many places in the eastern half of the compartment mixed with a large proportion of fragments of all sizes of the underlying freely-fissured, easily disintegrating sandstone ; excellent for chír, good for bánj.

Stock.—The upper fourth of the compartment, especially the broad shallow gullies, is fairly (0·6 to 0·8) stocked with vigorous chír of all ages, with a sprinkling of stunted bánj. Below this in the western half of the compartment, the ground is very open (density of stock 0·2 to 0·4), patches or solitary trees of chír and oak being scattered all over : the chír here also of good growth, the oak ruined by former severe lopping. In the eastern half the neighbourhood of the gadheras is fairly covered with vigorous oak, the rest of the ground being divided mainly between chír (vigorous, but low branched and of only moderate height, owing to former severe lopping and annual fires) and small blanks coinciding with patches of rock or bad soil.

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chír	138	13,800	5,520	870	52,200	21,750	2,206	44,120	26,472	3,406	...	23,842
Oaks ...	119	...	10,710	201	...	8,040	435	...	6,525	614	...	2,656
Ayar and brons ...	1	...	35	...	...	...	3	...	18	16	...	24
Sál	...	...	...	...	...	...	...	...	...	...	...	...
Sain	...	...	...	...	...	...	...	...	...	...	...	...
Cypress ...	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	258	13,800	16,265	1,071	52,200	29,790	2,644	44,120	33,015	4,036	...	26,522

Reproduction.—Excellent (coefficient of completeness 0·7), chiefly chír in all stages of growth. A few years will see the ground almost completely covered.

Grazing.—Light, confined to the vicinity of the cultivation along the Bhawáli gadhera.

Export lines.—There are no road or paths inside the compartment, but the Ránibágh-Khairna district and the Dhuni Khál-Hinnan forest bridle-roads run close to the boundary, and a good footpath follows the Bhawáli gadhera parallel to the southern boundary of the compartment.

Bhawáli 15.

Boundaries.—North, village lands of Siror Chhoti; east, prominent spur separating compartment from Bhawáli 17; south, main watershed ridge separating it from Bhawáli 16; west, Laria Kánta 7 and Bhawáli village lands.

Area.—A hundred and twenty-one acres, of which 20 unproductive.

Configuration and aspect.—This compartment occupies the lower funnel-shaped portion of the basin of a large feeder of the Bhawáli gadhera, with the addition (one-third of the whole compartment) of some westerly and north-westerly slopes drained directly into the Bhawáli gadhera. Excepting the site of the deserted fields of Sakniáni, the ground is generally rugged and from steep to very steep (28° to 50°). The main aspect is of course northerly, but the slopes forming the sides of the funnel look also respectively north-west, and, to a slight extent, east.

Elevation.—Maximum 6,500 feet, minimum 5,500 feet, mean about 5,800 feet.

Soil and underlying rock.—Soil sandy; superficial, poor and dry on the left side of the central stream and in the higher parts of the compartment; elsewhere generally deep and rich; resting on shale or loosely and often thinly-bedded sandstone; generally good for bánj and chír.

Stock.—On easterly aspects the stock consists almost entirely of groups of chiefly young chír of fairly good growth, separated by grassy blanks. The westerly aspects contain mainly mixed bánj, brons, and ayar forest with scattered chír, except along the crests of the spurs, where this last species is almost pure. The average density of growth on these aspects is about 0·7. The size and vigour of the bánj trees are very variable, but are on the whole respectable.

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chír ...	38	3,800	1,520	204	12,240	5,100	450	9,000	5,400	1,339	...	9,873
Oaks ...	191	...	17,190	370	...	14,800	748	...	11,220	1,256	...	5,024
Ayár and brons ...	98	...	3,430	365	...	6,570	357	...	2,142	2,489	...	3,733
Sál ...	...	...	...	...	...	...	...	...	...	...	...	...
Sain ...	...	...	...	...	...	...	...	...	...	...	...	...
Cypress ...	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	327	3,800	22,140	939	12,240	26,470	1,555	9,000	18,762	5,084	...	18,130

Reproduction.—Advance growth of all the species, especially chír, is good (0·6) but very young seedlings are rare.

Grazing.—Slight.

Export lines.—A footpath, ultimately meeting the upper Almora road about two and a half miles from the cantonment, traverses the compartment from north to south. Moreover, the Hinnan-Naini Tal bridle-road passes close to the northern boundary.

Bhawali 16.

Boundaries.—North, main watershed ridge separating compartment from Bhawali 15 and 17; east, Jábar raula separating it from Bhawali 18 ; south, spur separating it from Laria Kánta 6; west, prominent spur separating it from Laria Kánta 7.

Area.—Ninety-three acres, of which 15 unproductive.

Configuration and aspect.—This compartment occupies the broad bowl-shaped basin of one of the many-branched feeders of the Jábar raula. The ground falls rapidly (1,400 in 3,000 feet) from west to east, but gentle slopes of some extent occur everywhere, which were formerly utilized for cultivation. The bowl shape of the basin produces three several aspects, *viz.*, easterly (the prodominant), southerly and northerly.

Elevation.—Maximum 6,900 feet, minimum 5,500, mean about 5,000 feet.

Soil and underlying rock.—Soil sandy, of very variable depth, loamy and rich in the ravines and on the lower gentle slopes, everywhere mixed with a more or less large proportion of fragments of all sizes of the underlying shaly and freely-fissured, thinly-bedded sandstones; excellent for bánj and chír.

Stock.—The ravines and gullies are well stocked (0·8) with bánj and rhododendron forest, originating from coppice growth and, therefore, consisting of low, branchy trees. Similar forest fringes the upper extremity of the compartment. Otherwise the crop is composed chiefly of young chír. The steeper slopes, not having been encroached on by cultivation, are well covered (density 0·6 to 0·8), the rest, having been once under cultivation, being generally blank or showing a slight sprinkling of poles, and only occasionally, *viz.*, where the land has been longest deserted, presenting a good crop (density 0·6 to 0·8) mainly of uncounted poles. The chír is of vigorous growth, but the trees are comparatively low and branchy.

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chír	...	...	...	46	2,760	1,150	203	4,060	2,436	1,448	...	10,136
Oaks ...	122	...	10,980	171	...	6,840	343	...	5,145	621	...	2,484
Ayár and brons ...	9	...	315	82	...	1,476	432	...	2,592	1,494	...	2,241
Sál	...	...	...	...	...	...	...	...	...	...	...	...
Sain	...	...	...	...	...	...	...	...	...	...	...	...
Cypress ...	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	131	...	11,295	299	2,760	9,466	978	4,060	10,173	3,563	...	14,861

Reproduction.—Good (coefficient 0·5 to 0·7) inside or on the outskirts of existing forest and on old cultivation sites now long deserted, although new seedlings of bánj are rare. In the majority of the blanks the reproduction is extremely backward, and a heavy growth of grass covers the ground.

Grazing.—Light.

Export lines.—None.

Bhawáli 17

Boundaries.—North and east, village lands of Sirori Chhoti and Pharka, cultivation chak Jakh and Bhawáli gadhera ; south, Jábar raula separating compartment from Bhawáli 18 ; west, ridge and spur separating it from Bhawáli 15 and 16.

Enclosed private land.—Matialna, 11 acres.

Area.— A hundered and thirty-six acres, of which 20 unproductive.

Configuration and aspect.—This compartment is situated in the broad angle formed by the Bhawáli gadhera and its confluent the Jábar raula. The slopes are nearly everywhere very steep (30° to 50°), and some are scarped by deep ravines, which drain them into the streams below. The aspect is chiefly easterly, but minor northerly and southerly exposures occur.

Elevation.—Maximum 6,600 feet, minimum 5,100 feet, mean about 5,800 feet.

Soil and underlying rock.—Soil sandy, generally of fair and even good depth, overlying shales and freely-fissured sandstone. Excellent for bánj and chír.

Stock.—With the exception of the lower portion of the compartment skirting the Bhawáli gadhera of the deeper ravines, and of the sites of old cultivation, which are nearly everywhere densely (0·8 to 1·0) covered with bánj mixed with brons and some ayár and kokat, the stock consists chiefly of chír of all ages and of excellent growth. The average density of this chír forest is about 0·8, but in some places heavy fellings have been made not many years ago and are betrayed by blanks.

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chír	40	4,000	1,600	276	16,560	6,900	1,412	28,240	16,944	3,834	...	26,838
Oaks ...	156	...	14,040	315	...	12,600	957	...	14,355	4,837	...	19,348
Ayár and brons ...	13	...	455	57	...	1,026	295	...	1,770	1,512	...	2,268
Sál... ...	...	...	...	...	...	...	...	...	...	...	...	...
Sain	...	...	...	...	...	...	...	...	...	...	...	...
Cypress ...	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	209	4,000	16,095	648	16,560	20,526	2,664	28,240	33,069	10,183	...	48,454

Reproduction.—Advance growth of brons and ayár, and especially of brons in the shape of bushes, is abundant in the bánj area. Chír reproduction is in a backward state, owing to dense brushwood and grass generally springing up wherever an opening is made in the forest above. On the drier stony slopes, where the crop of grass is short and spare, chír seedlings are fairly numerous (0·4).

Grazing.—Light.

Export lines.—The lower end of the compartment is within easy reach (½ mile) of the Hinnan-Naini Tál forest bridle-road.

Bhawáli 18.

Boundaries.—North, the Jábar raula separating compartment from Bhawáli 17; east, prominent spur separating it from Bhawáli 19; south, prominent spur separating it from Bhawáli 28; west, prominent spur and Jábar raula separating it from Bhawáli 16 and Laria Kánta 6.

Area.—Eighty-nine acres, of which 15 unproductive.

Configuration and aspect.—This compartment occupies the north-westerly slopes which drain into the lower half of the Jábar raula. These slopes are divided off into well-marked rounded spurs by numerous watercourses which channel more or less deeply the hillsides. The gradients are pretty uniform and seldom exceed 30°, being steepest just above the raula.

Elevation.—Maximum 6,800 feet, minimum 5,000 feet, mean about 6,100 feet.

Soil and underlying rock.—Soil sandy, never very deep, containing vegetable mould in appreciable proportions only along the bottoms of the deeper ravines, resting on alternating shales and thinly-bedded sandstones; excellent for chír or bánj according to locality.

Stock.—The stock consists of well-defined belts of alternate chír and bánj and rhododendron forest, the former fringing the crests of the spurs (density 0·3 to 0·6), the latter of much greater width and density (0·5 to 0·8), clothing the ravines more than half way up to the crests of the spurs bounding them. The chír is of excellent growth, but the bánj has suffered from severe lopping and grazing, and forms principally low crooked coppice.

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chír ...	8	800	320	76	4,560	1,900	261	5,220	3,132	446	...	3,122
Oaks ...	114	...	10,260	174	...	6,960	254	...	3,810	477	...	1,908
Ayár and brons ...	56	...	1,960	185	...	3,330	577	...	3,462	3,702	...	553
Sál ...	...	...	...	...	...	...	...	...	...	...	...	...
Sáin ...	...	...	...	...	...	...	...	...	...	...	...	...
Cypress ...	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	178	800	12,540	435	4,560	12,190	1,092	5,220	10,404	4,625	...	5,583

Reproduction.—Very backward (coefficient 0·1 to 0·2) owing to the heavy grazing, which has hardened the soil, and, together with constant lopping, keeps down any seedlings that happen to come up in spite of adverse circumstances.

Grazing.—Very heavy.

Export lines.—None.

Bhawali 19.

Boundaries.—North and east, village lands of Pharka, and Bhawáli gadhera separating compartment from Bhawáli 14 and 17, and the Rámgád gadhera forming outer boundary of the forest ; south, Naini Tál-Almora bridle-road and one of the cultivation chaks of Bháti separating compartment from Bhawáli 20 and 25 ; west, Mr. Newton's and Colonel Wheeler's estates, and a spur separating compartment from Bhawáli 18.

Enclosed private land.

Cultivation chaks of Unani	5 acres.
Khallakhet	4 „

Area.—Two hundred and forty acres, of which 30 unproductive.

Configuration and as ect.—This compartment occupies the easterly slopes running up from the Rámgád gadhera immediately below the Naini Tál-Almora bridle-road. The ground is rather rugged, but the contours are generally rounded. The gradients vary between 18° and 35°. The main aspect is of course easterly, but the flanks of the spurs look also west, south or north.

Elevation.—Maximum 6,293 feet, minimum 5,000 feet, mean about 5,500 feet.

Soil and underlying rock.—In general a deep, moist, free, clayey sand with a very fair proportion of mould in most places, resting on alternate shales and sandstone. Two-thirds of the area excellent for bánj, the remaining third for mixed bánj and chír forest.

Stock.—The stock is all but complete, being only interspersed with a few patches of a lower density than 0 7. It is, on the whole, a young growing one, with a grand future before it. Bánj forms nearly half the crop everywhere, except on the knolls and crests of spurs and along the main ridge, where well-grown chír predominates.

Summary of valuation..

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chír ...	53	5,300	2,120	245	14,700	6,125	864	17,280	10,348	3,724	...	26,068
Oaks —...	263	...	23,670	515	...	20,600	1,609	...	24,135	9,174	...	36,696
Ayár and brons ...	38	...	1,330	166	...	2,988	1,126	...	6,756	6,711	...	10,066
Sál ...	...	...	...	...	...	...	...	...	...	...	...	...
Sain ...	...	...	...	...	...	...	...	...	...	...	...	...
Cypress ...	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	354	5,300	27,120	926	14,700	29,713	3,599	17,280	41,239	19,609	...	72,830

Reproduction.—In so well-stocked a forest there is scarcely any room for new seedlings. Low poles and saplings of bánj, chír, and brons are extremely abundant.

Grazing.—Nil.

Export lines.—As said before, the Nani Tál-Almora district bridle-road forms the southern boundary of the compartment. Moreover, the new Bhim Tál-Khairna district bridle-road runs through its whole length along the Rámgád gadhera.

Bhawáli 20.

Boundaries.—North, Naini Tál-Almora bridle-road and village lands of Dugai ; east, village lands of Shamaila, and a prominent spur separating compartment from

Bhawáli 21 ; south, Pirúnu Dhár ridge, separating it from Bhawáli 22 ; west, prominent ridge and spur separating it respectively from Bhawáli 24 and 25.

Enclosed private land.

Cultivation chaks of Bháti	2 acres.
Righar	2 „

Area.—A hundred and sixty-four acres, of which 25 unproductive.

Configuration and aspect.—This compartment comprises the western half of the head-waters of the Rámgád gadhera. The western two-thirds of the area face north-east, the remaining third north. The slopes are seldom steeper than 30°, the average gradient being only about 20°, but they are cut up in every direction by numerous deep narrow sots, often with precipitous sides, which render them very rugged and irregular.

Elevation.—Maximum 6,150 feet, minimum 5,500 feet, mean about 5,900 feet.

Soil and underlying rock.—A sandy soil, sometimes loamy, fairly deep, moist and rich, covered with dead leaves, resting partly on shales, but chiefly on soft sandstones. Excellent for bánj over two-thirds of the area ; elsewhere good for chír.

Stock.—A very promising crop. The average density is about 0 7. Chír of fair growth, but rather stunted, predominates in the northern and southern portions of the compartment ; elsewhere bánj, very vigorous, but still showing the effects of former severe lopping, is the principal tree. Brons and, in much smaller numbers, ayar are spread more or less uniformly everywhere. A few phanyath crop up in the lower portions near the gadhera.

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chír ...	...	...	...	...	...	...	184	3,680	2,208	1,389	...	9,723
Oaks ...	52	...	4,680	145	...	5,800	766	...	11,490	3,123	...	12,492
Ayár and brons ...	2	...	70	...	...	...	505	..	3,030	3,073	...	4,609
Sál ...	...	...	...	...	...	...	...	...	...	...	...	...
Saiu ...	...	...	...	...	...	...	...	...	...	...	...	...
Cypress ...	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	54	...	4,750	145	...	5,800	1,455	3,680	16,728	7,585	...	26,824

Reproduction.—Young coppice of bánj is very abundant, as are also small seedlings of chír in the portions affected by that species. The average co-efficient may be put down at 0·7.

Grazing.—Slight.

Export lines.—The Naini Tál-Almora district bridle-road runs along the northern boundary of the compartment for nearly a mile.

Bhawáli 21.

Boundaries.—North, cultivation of Shám khet ; east and south, Jioli-Shám khet bridle-path and village lands Ghural Dhár and Tircha khet ; west, two well-marked spurs and village lands of Shamaila separating compartment from Bhawali 20 and 22.

Enclosed private land.—Cultivation chak of Tiunara, 2 acres.

Area.—Sixty-five acres, of which 10 unproductive.

Configuration and aspect.—This compartment occupies the eastern slope of the Bhim Tál gadhera valley immediately to the north of Tircha khet. The gradients are

steep (35° to 45°), but do not vary in an abrupt manner. The compartment is well protected on the north and west.

Elevation.—Maximum 6,000 feet, minimum 5,400 feet, mean about 5,700 feet.

Soil and underlying rock.—As in the greater portion of Bhawáli 22, but perhaps a degree inferior.

Stock.—The northern half of this compartment is very bare, the coefficient of density rarely exceeding 0·2, and the chief species is bánj, short, crooked, and much branched. In the southern half the mean density is about 0 6, the stock standing in patches separated by narrow blank intervals, and consisting principally of low bánj coppice interspersed with stunted branchy chír and just a suspicion of brons. Bushes of *Euphorbia* are sprinkled all over the hillside.

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chír ...	5	500	200	16	960	400	29	580	348	168	...	1,176
Oaks ...	49	...	4,410	127	...	5,080	363	...	5,445	872	...	3,488
Ayár and brons ...	...	...	...	3	...	54	3	...	18	10	...	15
Sal ...	...	...	...	...	...	...	...	...	...	...	...	...
Sain ...	...	...	...	...	...	...	...	...	...	...	...	...
Cypress ...	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	54	500	4,610	146	960	5,534	395	580	5,811	1,050	...	4,679

Reproduction.—The mean coefficient of completeness in the northern half of the compartment is 0 1, in the southern half barely 0 4. Bánj and chír occur in about equal proportions, very little of the advance growth being of recent origin owing to the heavy grazing.

Grazing.—Heavy.

Export lines.—This compartment is extremely accessible, being situated in the angle formed by the Jioli-Shám khet district bridle-path and the Naini Tal-Almora district bridle-road about five miles from the former station.

Bhawáli 22.

Boundaries.—North, Piranu dhár ridge separating compartment from Bhawáli 20; east, prominent spur separating it from Bhawáli 21, and village lands of Tircha khet; south, Bhawáli 23; west, prominent spur separating compartment from Bhawáli 24.

Area.—A hundred and seven acres, of which 20 unproductive.

Configuration and aspect.—A well-defined bay formed by a small watercourse and its numerous little feeders going south into the gadhera draining Tircha khet. The main aspect is hence southerly, although the sides of the bay, comprising one-half and one-third of the compartment respectively, look east and west. The gradients of these easterly and westerly slopes range from 35° to 45°, while those of the purely southerly slopes at the head of the bay vary from 15° to 30°. Nowhere do the gradients change at all abruptly.

Elevation.—Maximum 6,200 feet, minimum 5,300 feet, mean about 5,800 feet.

Soil and underlying rock.—Soil sandy, dry, of very variable depth, mixed with large fragments of all sizes of the underlying alternating shale and freely-fissured sandstone; fairly rich in vegetable mould along the main watercourse; medium soil for both chír and bánj.

Stock.—The average density along the main watercourse (about one-fourth of the compartment) is about 0·7 ; elsewhere it is only 0·1. The stock along the main watercourse consists chiefly of small bánj coppice, sprinkled with brons and ayár. On easterly aspects it is principally chír with a sprinkling of bánj, which just predominates in two or three of the deeper gullies. On the westerly slopes there is small bushy bánj with a few rare chír. The growth of this last species is not vigorous, and the average height of the mature trees does not exceed 70 feet.

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chír ...	26	2,600	1,040	72	4,380	1,825	138	2,760	1,656	394	...	2,758
Oaks ...	42	...	3,780	122	...	4,880	252	...	3,780	1,274	...	5,096
Ayár and brons,	1	...	35	1	...	18	15	...	90	26	...	39
Sál ...	...	...	...	...	...	...	...	...	...	...	...	...
Sain ...	...	...	...	...	...	...	...	...	...	...	...	...
Cypress ...	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	69	2,600	4,855	195	4,380	6,723	405	2,760	5,526	1,694	...	7,893

Reproduction.—The mean coefficient of completeness may be put down at 0·4, the proportion of bánj to chír being as 1 to 3. The reproduction would be much better without the grazing.

Grazing.—Very heavy ; large herds belonging to professional graziers are pastured here.

Export lines.—The bridle-path following the Sáth Tál nadi to Shám khet, where it joins the Naini Tál-Almora district bridle-road, passes within 150 yards of the lower end of the compartment.

Bhawáli 23.

Boundaries.—North, footpath from Aksára to Tircha khet, and a small spur separating compartment from Bhawáli 22 and 24 ; east, village lands of Tircha khet ; south, prominent ridge separating compartment from Kuria 14 ; west, Kuriagád and Bhawáli gadhera separating it from Kuria 8.

Area.—A hundred and twenty-one acres, of which 30 unproductive.

Configuration and aspect.—This compartment comprises the broad saddle-back crossed by the footpath from Aksára to Tircha khet and the slopes which run down on each side of it, westward to the Kuria gád and Bhawáli gadhera, eastward to the Tircha khet sot. The ground at and west of the saddle-back, forming about one-fourth of the compartment, is open and consists of easy north-westerly slopes, the gradients varying from 10° to 25°. The slopes above Tircha khet, constituting another fourth of the compartment, fall eastwards at an average angle of about 40°. The remaining portion of the area forms a deep narrow gorge enclosed by very steep, often precipitous, rugged sides, which generally look north-west.

Elevation.—Maximum 5,650 feet, minimum 4,100 feet, mean about 4,900 feet.

Soil and underlying rock.—A sandy loam ; fairly deep, moist and rich on and near the saddle-back and the bottom of the gorge ; elsewhere superficial, but seldom wanting, except on the precipitous slopes overhanging the Kuriagád. The underlying rock is sandstone. Good soil for chír and bánj generally.

Stock.—The easy slopes on and near the saddle-back have recently been under cultivation, and, owing to the richness of the soil, have become covered with a dense impenetrable, low growth of shrubs and brambles. The bottom of the gorge is filled with bánj mixed with kaunla, &c. The slopes above Tircha khet bear an open (density 0·5) forest of stunted and branchy bánj and inferior species. Elsewhere (all the remaining steeper slopes) chír of good growth is almost pure. In time this will become a very valuable forest in spite of the very steep slopes.

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of Timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chír ...	30	3,000	1,200	167	10,020	4,175	427	8,540	5,124	354	...	2,478
Oaks ...	14	...	1,260	70	...	2,800	206	...	3,090	347	...	1,388
Ayár and brons ...	...	...	...	5	...	90	17	...	102	116	...	174
Sál ...	...	...	...	...	...	...	...	...	...	...	...	...
Sain ...	1	50	55	1	30	20	7	56	70	15	...	90
Cypress ...	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	45	3,050	2,515	243	10,050	7,085	657	8,596	8,386	832	...	4,130

Reproduction.—On the old cultivation sites, as is to be expected, *nil.* It is slightly better on the slopes above Tircha khet. Elsewhere chír seedlings may be represented by an average coefficient of 0·4.

Grazing.—Slight.

Export lines.—The footpath from Aksára to Tircha khet traverses the compartment from end to end. There is also a small footpath branching off from the former and going up to the top of the main ridge.

Bhawáli 24.

Boundaries.—North, main watershed ridge separating compartment from Bhawáli 20; east, main watershed ridge separating it from Bhawáli 22; south, Aksára-Tircha khet footpath separating it from Bhawáli 23; west, the Bhungád separating it from Bhawáli 26.

Area.—A hundred and ninety-four acres, of which 35 unproductive.

Configuration and aspect.—This compartment occupies the very steep (gradients 30° to 50°) westerly slopes of the deep narrow gorge through which the Bhungád runs. These slopes are drained by several sots, the three principal of which, with their feeders, form deep bays with precipitous sides going right up to the main watershed ridge.

Elevation.—Maximum 6,200 feet, minimum 4,736 feet, mean about 5,500 feet.

Soil and underlying rock.—Soil sandy, of very variable depth, often rich and moist in the ravines and gullies, elsewhere drier and gravelly, but always bearing a good crop of grass, resting on freely-fissured sandstone. Soil excellent for bánj along the ravines and for chír everywhere else.

Stock.—The stock consists of broad zones of tall, well-grown chír (density 0·3 to 0·6), alternating with narrow belts of bánj and brons forest mixed with kaunla, koiral, and *Engelhardtia*, and which hung and run down the ravines and gullies with a density of 0·8.

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chír	82	8,200	3,280	532	31,920	13,300	1,304	26,080	15,672	1,845	...	12,915
Oaks ...	233	...	20,970	348	...	13,920	665	...	9,975	1,456	...	5,824
Ayár and brons ...	17	...	595	91	...	1,638	442	...	2,652	1,183	...	1,774
Sál	...	...	...	...	...	...	...	...	...	...	...	...
Sain	...	...	...	...	...	...	...	...	...	...	...	...
Cypress ...	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	332	8,200	24,845	971	31,920	28,858	2,411	26,080	28,299	4,484	...	20,513

Reproduction.—In the ravines and gullies young growth of bánj and brons is nearly abundant enough to complete the crop; elsewhere the heavy covering of grass is keeping back chír reproduction, which may be represented only by a co-efficient of 0 2.

Grazing.—Nil.

Export lines.—There are only two footpaths in the compartment, running along respectively its western and eastern boundaries; nevertheless, the compartment is generally very inaccessible on account of the steepness of the slopes.

Bhawali 25.

Boundaries.—North, Mr. Newton's estate and the Naini Tál-Almora bridle-road; east and south, two prominent spurs separating compartment respectively from Bhawáli 20 and 24, west, the Bhungád separating it from Bhawáli 26 and 27.

Area.—Seventy-five acres, of which 10 unproductive.

Configuration and aspect.—This compartment occupies the westerly and sometimes north-westerly slopes on the left bank of the Bhungád near its source. Except the higher ground at the southern extremity of the compartment, the gradients everywhere exceed 35° and are often precipitous. The northern half of the area is very rugged.

Elevation.—Maximum 6,067 feet, minimum 5,000 feet, mean about 5,700 feet.

Soil and underlying rock.—Soil sandy, generally shallow, rich in mould in places resting on hard but freely-fissured and often schistose sandstone; good generally for chír and bánj.

Stock.—The density of the crop is pretty uniform, generally varying between 0·6 and 0·7. Bánj predominates in the more rugged northern half of the compartment, while chír is the main species on the higher drier slopes in the southern half. In many places where bánj and pine forest meet, the two trees are mixed in about equal proportions. Brons in considerable numbers and ayár to a smaller extent is distributed everywhere. The chír trees, although fairly well shaped, are stunted and are not vigorous looking. The bánj consists chiefly of pollards, the result of former heavy lopping. There is excellent promise for the crop in this compartment in the next generation.

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chír ...	...	...	...	...	...	...	462	9,240	5,544	754	...	5,278
Oaks ...	69	...	6,210	85	...	3,400	491	...	7,365	624	...	2,496
Ayár and brons ...	6	...	210	32	...	576	150	...	900	909	...	1,363
Sál ...	...	...	...	...	...	...	...	...	...	...	...	...
Sain ...	...	...	...	...	...	...	...	...	...	...	...	...
Cypress ...	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	75	...	6,420	117	...	3,976	1,103	9,240	13,809	2,287	...	9,137

Reproduction.—The young growth, comprising all ages, is nearly sufficient to complete the crop, and consists equally well of chír, bánj and brons and ayár. The older chír saplings have suffered from severe fires and are crooked and sickly.

Grazing.—Nil.

Export lines.—As said above, the Naini Tál-Almora district bridle-road forms the northern boundary of the compartment.

Bhawali 26.

Boundaries.—North and west, footpath separating compartment from Bhawáli 27, and village lands of Bhungád; east, the Bhungád separating compartment from Bhawáli 24 and 25; south, village lands of Aksára.

Area.—Eighty-six acres, of which 15 unproductive.

Configuration and aspect.—This compartment occupies the easterly slope of the narrow Bhungád basin immediately east of the village lands of Bhungád and north of Aksára. The ground is cut up into numerous little gullies, with small spurs rising up between. The gradients are generally very steep (30° to 45°). The compartment is completely sheltered on the east, north, and west.

Elevation.—Maximum 5,500 feet, minimum 4,750 feet, mean about 5,200 feet.

Soil and underlying rock.—Soil loose, shaly, practically of unlimited depth, moist, covering itself with a strong growth of grass; good for bánj.

Stock.—The density is more or less uniformly 0·6. The crop consists chiefly of low, crooked, branchy bánj, with stunted chír occupying the crests of the spurs and ridges. The chír seems to be disappearing and yielding the place to bánj, which had been kept down by the severe lopping it was yearly subjected to before the beginning of conservation. Inferior species are fairly numerous, the most abundant among them being *Engelhardtia* and *Bauhinia variegaia* and *Machilus.*

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chír ...	26	2,600	1,040	167	10,020	4,175	219	4,380	2,628	93	...	651
Oaks ...	29	...	2,610	149	..	5,960	569	...	8,535	1,244	...	4,976
Ayár and brons ...	...	...	...	...	...	...	2	...	12	59	..	88
Sál ...	...	...	...	...	...	...	...	...	...	...	...	...
Sain ...	...	...	...	...	...	...	...	...	...	...	...	...
Cypress ...	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	55	2,600	3,650	316	10,020	10,135	790	4,880	11,175	1,396	...	5,715

Reproduction.—The little room that there is for new growth to come up in is filling up chiefly with young bánj up to the sapling stage. The steepness of the slopes renders natural reproduction slow.

Grazing.—Very slight.

Export lines.—There is nothing better than a footpath running the whole length of the compartment.

Bhawali 27.

Boundaries.—North, Mr. Newton's estate; east, footpath separating compartment from Bhawali 25 and 26; south, village lands of Bhungad; west, prominent spur separating compartment from Bhawali 29, and Naini Tal-Almora bridle-road separating it from Bhawali 28.

Area.—A hundred and two acres, of which 20 unproductive.

Configuration and aspect.—This compartment occupies the easterly slopes below the upper Almora road west of Mr. Newton's estate down to the footpath leading from that estate to Bhungad village. The ground is very rugged, the slopes being cut up by deep ravines and gullies which drain them south-eastwards into the Bhungad gadhera. The gradients vary generally from 20° to 40°.

Elevation.—Maximum 6,500 feet, minimum 5,500 feet, mean about 6,000 feet.

Soil and underlying rock.—Soil sandy, of very variable depth, but never very deep, fairly rich only in the ravines and gullies, overlying easily-disintegrated sandstone.

Stock.—The density ranges from 0·9 in the ravines and gullies to 0·4 on the dry spurs. Bánj of good growth predominates in the ravines mixed with a considerable proportion of brons. Elsewhere chír of vigorous growth, many of them mature, is the predominant species.

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chír ...	35	3,500	1,400	291	17,460	7,275	841	16,820	10,092	887	...	6,209
Oaks ...	210	...	18,900	309	...	12,360	770	...	11,550	1,247	...	4,988
Ayar and brons ...	6	...	210	14	...	252	163	...	978	708	...	1,062
Sál ...	...	...	...	...	...	...	...	...	...	...	...	...
Sain ...	...	...	...	...	...	...	...	...	...	...	...	...
Cypress ...	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	251	3,500	20,510	614	17,460	19,887	1,774	16,820	22,620	2,842	...	12,259

Reproduction.—In the ravines and gullies, the advance growth consists chiefly of bánj and brons coppice represented by a coefficient of 0·5; elsewhere the reproduction may be expressed by 0·3, and consists of chír and bánj in the proportion of 2 to 1, the bánj being chiefly in the state of young coppice-shoots.

Grazing.—Slight.

Export lines.—The Naini Tal-Almora bridle-road and a footpath ultimately meeting it run along the boundary of the compartment (see *Boundaries*).

Bhawali 28.

Boundaries.—North, prominent spur separating compartment from Bhawali 18 and 19; east and south, Colonel Wheeler's and Mr. Newton's estates and Naini Tal-Almora bridle-road separating compartment from Bhawali 27 and 29; west, prominent spur separating it from Laria Kanta 5 and 6.

Area.—Ninety acres, of which 20 unproductive.

Configuration and aspect.—This compartment occupies the slopes coming down from the Bhains khal ridge and resting up against the Newton and Wheeler estates on the east and the Naini Tal-Bhim Tal road on the south. The northern half, with gradients of from 25° to 35°, consists of more or less uniform easterly slopes. The southern half is extremely rugged, being channelled by deep gullies, and is separated from the northern half by abrupt scarps. The gradients here never vary very much. The general aspect is also easterly, but owing to the frequent alternations of even slopes and irregular gullies, the aspect sometimes becomes southerly.

Elevation.—Maximum 7,040 feet, minimum 6,100 feet, mean 6,400 feet.

Soil and underlying rock.—The soil is argillo-silicious, very free, of very variable depth, mixed with a large proportion of debris of all sizes of the underlying shale and sandstone, becoming fairly rich in the depressions; very good for bánj.

Stock.—The average density is 0·9, blanks being few and of limited extent. The elevation in this compartment becomes too high for chír, which disappears about the middle of the compartment, so that the stock consists mainly of bánj and brons with ayar. The bánj is of vigorous growth, but, as a rule, misshapen and crooked.

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chír ...	16	1,600	640	63	3,780	1,575	265	5,300	3,180	599	...	4,193
Oaks ...	197	...	17,730	248	...	9,920	638	...	9,570	1,521	...	6,084
Ayar and brons ...	64	...	2,240	173	...	3,114	788	...	4,728	2,644	...	3,966
Sál ...	...	...	...	...	...	...	...	...	...	...	...	...
Sain ...	...	...	...	...	...	...	...	...	...	...	...	...
Cypress ...	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	277	1,600	20,610	484	3,780	14,609	1,691	5,300	17,478	4,764	...	14,243

Reproduction.—The coefficient of completeness is only about 0·3, owing to the density of the stock. The advance growth consists chiefly of young coppice bánj, brons and ayar.

Grazing.—Light

Export lines.—The existing export lines are the Naini Tal-Bhim Tal bridle-road and footpaths forming the southern and eastern boundaries of the compartment.

Bhawali 29.

Boundaries.—North and west, spur separating compartment from Laria Kanta 4 and 5; east, ridge and spur separating it from Bhawali 27; south, village lands of Bhungád, and a spur separating compartment from Kuria 7.

Area.—Seventy acres, of which 12 unproductive.

Configuration and aspect.—This compartment occupies the long deep ladle-shaped bay formed by a much-branched feeder of the Jioli raula. The slopes are every-

where very rugged and steep (gradients 30° to 60°), and contain many deep, cool glens. The main aspect is westerly, but the scarps forming the western side of the bay look south and south-east. The ground falls 1,600 feet in a distance of about 3,300 feet.

Elevation.—Maximum 6,500 feet, minimum 4,900 feet, mean about 5,600 feet.

Soil and underlying rock.—Soil sandy, generally shallow, except along the bottoms of the ravines, covered with a dense growth of short grass or with a thick layer of pine needles, resting on schistose sandstone. Small landslips have occurred. Soil excellent for bánj and chír forest.

Stock.—The average density of the crop is about 0·5. Bánj extends over the whole compartment. In the deeper ravines in the lower half of the compartment it forms a complete mass of almost pure forest. In the gullies higher up it is mixed with an equal proportion of brons and a few chír. This latter species is, however, almost pure on the spurs and in the upper portion of the compartment. The pine trees are tall and well-grown, but many of them have been heavily tapped in former times for resin. This compartment holds out good promise in a not very distant future.

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chír ...	29	2,900	1,160	98	5,880	2,450	227	4,540	2,724	288	...	1,616
Oaks ...	63	...	5,670	136	...	5,440	405	...	6,075	654	...	2,616
Ayar and brons...	4	...	140	12	...	216	62	...	372	236	...	354
Sál ...	...	...	...	...	...	...	...	...	...	...	...	...
Sain ...	...	...	...	...	...	...	...	...	..	...	...	...
Cypress ...	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	96	2,900	6,970	246	5,880	8,106	694	4,540	9,171	1,178	...	4,586

Reproduction.—There is an abundance of bánj copice-shoots over the whole compartment, the spurs and the higher ground at the top excepted, but new seedlings are rare. Pine seedlings make a very fair show in and near chír forest. The average coefficient of completeness is about 0·6.

Grazing.—Slight and only limited to the vicinity of Bhungád village.

Export lines.—An angle of the Naini Tal-Almora district bridle-road touches the northern extremity of the compartment, and several small footpaths coming from near the cantonment cross it from west to east.

CHAPTER V.—BUDHLAKOT BLOCK.

Boundaries—North, the outer boundary of the forest, formed for a part of its length by the Bargal raula; east, the Jakh nadi, partly forming the outer boundary of the forest, partly separating the block from the Bhawali block; south, village lands of Chorsa and Sabjia, and the Tikri nadi and one of its feeders, the Binaik raula, separating it from the Jákh block; west the Kalwagad forming the outer boundary of the forest, and a spur separating the block from the China block and the village lands of Churâni.

Enclosed private estate.—A straggling continuous belt of village lands, of very variable width and comprising 637 acres, runs across the block from north to south dividing it into two very unequal portions. Eight other plots, measuring from one to 14 acres and aggregating 33 acres, are scattered throughout the block.

Area.—Nineteen hundred and thirteen acres, of which 520 productive.

Number of component compartments.—11.

Configuration and aspect.—The block occupies both sides of a large, high hill running south-west and north-east, between the Tikri and Jakh nadis on the east and south and the Kalwagad and Bargal raula on the north-west and north. The crests of the ridges and spurs are generally sharp and well-defined, and the gradients of the slopes, which are usually rugged, vary from 20° to 50° and upwards, but generally exceed 35°.

Elevation.—Maximum 7,965 feet, minimum 3,265 feet, mean 5,000 feet.

Soil and underlying rock.—The soil is generally sandy, of very variable depth, humidity and richness according to gradient of slopes, and overlies loosely-bedded, freely-fissured, easily-disintegrating sandstones, which sometimes become quartzitic and are exposed on the steeper slopes. The hillsides in many places are liable to break away, and recent landslips, some of them very extensive, are not uncommon.

Stock.—The steep slopes overhanging the Jakh nadi bear an open mixed lower forest of inferior species. Elsewhere chír predominates, giving place to bánj in the ravines, along the edge of the main streams, and on some of the moister northerly slopes. The chír is principally young, heavy fellings having taken place here not many years ago; but the trees, poles and saplings are full of the highest promise. Reproduction in oak forest is generally very good, in chír forest fair but occasionally excellent.

In the subjoined statement the results of the enumeration survey by compartments are summarized:—

Species.	Diameter-class.	Compartment 1, area 398 acres. Gross number of trees.	Compartment 1, area 398 acres. Number of trees per acre.	Compartment 2, area 153 acres. Gross number of trees.	Compartment 2, area 153 acres. Number of trees per acre.	Compartment 3, area 70 acres. Gross number of trees.	Compartment 3, area 70 acres. Number of trees per acre.
Chír ...	I	676	1·69	239	1·56	62	...
	II	1,682	4·22	769	4·99	...	...
	III	2,995	7·52	1,169	7·59	...	...
	IV	2,589	6·50	1,334	8·66	...	...
Totals ...	...	7,942	19·93	3,511	22·70	...	...
Phanyáth ...	I	...	...	...	...	...	...
	II	...	...	...	...	...	...
	III	...	...	...	...	...	...
	IV	...	...	...	...	...	...
Totals ...	...	...	...	...	...	...	...
Bánj ...	I	705	1·77	96	0·63	...	...
	II	757	1·89	154	1·00	...	...
	III	1,181	2·95	338	2·19	...	...
	IV	1,105	2·77	448	2·91	...	...
Totals ...	...	3,748	9·39	1,036	6·71	...	...
Tilonj ...	I	23	0·05	...	...	...	...
	II	11	0·03	...	...	...	...
	III	24	0·06	...	...	...	...
	IV	79	0·20	...	...	...	...
Totals ...	...	137	0·34	...	...	...	...
Ayár ...	I	6	0·01	1	0·01	...	...
	II	76	0·19	2	0·01	...	...
	III	131	0·33	19	0·12	...	...
	IV	390	0·94	64	0·42	...	...
Totals ...	...	603	1·47	86	0·56	...	...
Brons ...	I	154	0·38	3	0·02	...	...
	II	245	0·61	9	0·06	...	...
	III	421	1·05	45	0·29	...	...
	IV	732	1·83	114	0·74	...	...
Totals ...	...	1,552	3·88	171	1·11	...	...
Sain ...	I	...	...	...	...	...	...
	II	...	...	...	...	...	...
	III	...	...	...	...	...	...
	IV	...	...	...	...	...	...
Totals ...	...	...	...	...	...	...	...
GRAND TOTALS ...	...	13,982	34·95	4,804	31·19	...	...

Species.	Diameter-class.	Compartment 4, area 332 acres.		Compartment 5, area 82 acres.		Compartment 6, area 147 acres.		Compartment 7, area 171 acres.	
		Gross number of trees.	Number of trees per acre.	Gross number of trees.	Number of trees per acre.	Gross number of trees.	Number of trees per acre.	Gross number of trees.	Number of trees per acre.
Chír ...	I	...	...	62	0·75	20	0·13	44	0·25
	II	...	...	127	1·55	327	2·22	162	0·94
	III	...	...	218	2·66	1,167	7·93	314	1·83
	IV	...	...	229	2·79	1,270	8·63	1,025	5·99
Totals ...	...	...	...	636	7·75	2,784	18·91	1,545	9·01
Phanyáth ...	I	...	...	4	0·05	2	0·01	2	0·01
	II	...	...	9	0·11	13	0·08	4	0·02
	III	...	...	32	0·39	79	0·53	19	0·11
	IV	...	...	93	1·13	196	1·33	135	0·78
Totals ...	...	...	...	138	1·68	290	1·95	160	0·92
Bánj ...	I	...	...	7	0·08	11	0·07	422	2·46
	II	...	...	11	0·13	27	0·18	556	3·25
	III	...	...	19	0·23	107	0·72	1,020	5·96
	IV	...	...	34	0·41	346	2·35	3,883	22·70
Totals ...	...	...	...	71	0·86	491	3·32	5,881	34·37
Tilonj ...	I	...	...	...	...	...	...	...	...
	II	...	...	...	...	...	...	...	...
	III	...	...	...	...	...	...	...	...
	IV	...	...	...	...	...	...	...	...
Totals ...	...	...	...	...	...	...	...	...	...
Ayár ...	I	...	...	...	...	...	...	1	...
	II	...	...	1	0·01	...	...	4	0·02
	III	...	...	3	0·03	3	0·02	42	0·24
	IV	...	...	42	0·51	67	0·45	413	2·41
Totals ...	...	...	...	46	0·55	70	0·47	460	2·67
Brons ...	I	...	...	...	...	1	...	4	0·02
	II	...	...	...	...	...	...	27	0·15
	III	...	...	...	...	...	...	100	0·58
	IV	...	...	2	0·02	5	0·03	373	2·18
Totals ...	...	...	...	2	0·02	6	0·03	504	2·93
Sain ...	I	...	...	2	0·02	1	...	...	...
	II	...	...	...	...	4	0·02	...	...
	III	...	...	19	0·23	20	0·13	...	...
	IV	...	...	54	0·65	79	0·53	...	...
Totals ...	...	...	...	75	0·90	104	0·68	...	...
GRAND TOTALS ...	...	...	...	968	11·80	3,745	25·36	8,550	49·90

Compartment 8, *area* 151 *acres.*		*Compartment* 9, *area* 135 *acres.*		*Compartment* 10, *area* 185 *acres.*		*Compartment* 11, *area* 137 *acres.*		*Entire block, area* 1,913 *acres.*	
Gross number of trees.	Number of trees per acre.	Gross number of trees.	Number of trees per acre.	Gross number of trees.	Number of trees per acre.	Gross number of trees.	Number of trees per acre.	Gross number of trees.	Number of trees per acre.
90	0·59	38	0·27	19	0·14	11	0·08	1,199	0·63
449	2·97	398	2·95	346	2·54	139	1·01	4,399	2·29
997	6·60	1,962	14·53	2,374	17·46	834	6·04	12,030	6·28
2,155	14·27	4,234	31·36	2,410	17·72	1,763	12·78	17,009	8·89
3,691	24·43	6,632	49·12	5,149	37·86	2,747	19·91	34,637	18·10
1	...	2	0·01	2	0·01	...	...	13	...
2	0·01	8	0·06	6	0·04	2	0·01	44	0·02
10	0·06	20	0·15	34	0·25	7	0·05	201	0·10
16	0·10	36	0·27	140	1·03	36	0·26	652	0·34
29	0·17	66	0·49	182	1·33	45	0·33	910	0·47
456	3·00	106	0·78	90	0·66	359	2·60	2,242	1·17
633	4·20	314	2·32	299	2·20	423	3·06	3,174	1·65
846	5·60	612	4·53	1,030	7·57	863	6·26	6,016	3·14
1,586	10·50	1,257	9·31	2,724	20·03	1,468	10·64	12,851	6·71
3,521	23·30	2,289	16·95	4,143	30·46	3,113	22·56	24,283	12·69
...	...	...	...	...	...	...	...	23	0·01
...	...	...	...	...	...	...	...	11	...
...	...	...	...	...	...	1	0·01	25	0·01
...	...	...	...	...	...	4	0·03	83	0·04
...	...	...	...	...	..	5	0·04	142	0·07
4	0·02	1	0·01	1	0·01	7	0·05	21	0·01
21	0·13	10	0·07	7	0·05	19	0·14	140	0·07
161	1·06	57	0·42	56	0·41	274	1·98	746	0·39
904	5·98	581	4·30	856	6·29	2,059	14·92	5,376	2·81
1,090	7·19	649	4·80	920	6·76	2,350	17·09	6,283	3·29
40	0·26	8	0·06	2	0·01	115	0·83	327	0·17
164	1·08	52	0·38	14	0·10	226	1·64	737	0·38
683	4·52	176	1·30	121	0·89	916	6·64	2,462	1·28
2,100	13·90	1,351	10·01	937	6·89	4,471	32·40	10,085	5·27
2,987	19·76	1,587	11·75	1,074	7·89	5,728	41·51	13,611	7·11
...	...	...	...	...	...	...	...	3	...
...	...	...	...	...	...	...	...	4	...
...	...	...	...	...	...	...	...	39	0·02
...	...	...	...	...	...	...	...	133	0·07
...	...	...	...	...	...	...	...	179	0·09
11,318	74·85	11,223	83·13	11,468	84·32	14,004	101·48	80,045	81·84

Grazing.—As only the cattle of the enclosed villages are admitted here, the grazing is heavy only in the vicinity of those villages, being light and sometimes even entirely absent elsewhere.

Export lines.—This is the least accessible block of the forest, owing both to greater distance from the station and to the absence of anything but the usual villagers' footpaths ; but the Pangot-Ratghát bridle-road runs along the Tikri nadi.

Budhlákot 1.

Boundaries.—North, outer boundary of the forest and ridge separating compartment from Budhlákot 11 ; east, spur separating it from Budhlákot 2 ; village lands of Sabjia and the Tikri nadi ; south, Binaik rauta separating from Jákh 12 and Chína 19 ; west, village lands of Churáni, and ridge separating compartment from Chína 21.

Enclosed private lands.

Chak Dudali No. 1	1 acre.
Ditto No. 2	2 acres.
Village lands of Dária	14 „

Area.—Four hundred acres, of which 70 unproductive.

Configuration and aspect.—This compartment occupies the broad, open basin above the villages of Sabjia and Dária, which is drained by several sots south-eastwards into the Tikri nadi. The spurs between the several sots are none of them very prominent, and hence the numerous ravines which furrow the hillsides are more or less open and shallow. The average gradient is about 30°, but there are many slopes which are precipitous and others gentle enough for cultivation.

Elevation.—Maximum 7,965 feet, minimum 5,100 feet, mean about 6,500 feet.

Soil and underlying rock.—Sandy, of very variable depth, always shallow on the steeper slopes, rich and full of mould in the deeper ravines, resting on thinly and loosely-bedded sandstones, which sometimes become quartzitic. Excellent for chír and bánj.

Stock.—The deeper ravines are stocked chiefly with bánj forest containing a fair proportion of brons, the density ranging from 0·6 to 0·8 ; the trees here are generally stunted and badly grown The steeper slopes have a sprinkling of bánj chiefly, with brons and ayár. Otherwise the stock consists almost purely of vigorous chír, with an average density of about 0·4 on the higher slopes and sharper spurs, and of about 0·6 elsewhere. Many of the full-grown chír trees are more than a hundred feet high, with tall, straight, cylindrical stems, which sometimes measure over 9 feet in girth.

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chír ...	676	67,600	27,040	1,682	100,920	42,050	2,995	59,900	35,940	2,589	...	18,123
Oaks ...	728	...	65,520	768	...	30,720	1,205	...	18,075	1,184	...	4,736
Ayár and brons,	160	...	5,600	321	...	5,778	552	...	3,312	1,122	...	1,683
Sál ...	...	...	...	...	...	...	...	...	...	...	...	...
Sain ...	...	...	...	...	...	...	...	...	...	...	...	...
Cypress ...	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	1,564	67,600	98,160	2,771	100,920	78,548	4,752	59,900	57,327	4,895	...	24,542

Reproduction.—Excellent, except on the very steep slopes. The reproduction of chír is especially good, many old cultivation sites being completely cropped with chír poles and saplings.

Grazing.—Slight.

Export lines.—The Pangot-Jákh district bridle-road runs through the compartment parallel to the Binaik raula and Tikri nadi.

Budhlákot 2.

Boundaries.—North, prominent ridge separating compartment from Budhlákot 11; east, partly prominent watershed line separating it from Budhlákot 8, partly village lands of Budhlákot; south and west, partly Jákh 8 with Tikri nadi between, partly village lands of Sabjia and partly a prominent spur separating compartment from Budhlákot.

Area.—A hundred and fifty-four acres, of which 30 very unproductive.

Configuration and aspect.—This compartment occupies the whole of the broad deep bay formed by one of the feeders of the Tikri nadi, and rests up against Budhlákot on the east. The sides of the bay are furrowed by numerous small channels, which render them very rugged. The gradients always exceed 28°, the ruling one being over 35° and the ground falling nearly 1,800 feet in 4,000 feet. At its lower end the basin contracts before it debouches into the ravine of the Tikri nadi: here scarps prevail. The main aspect is of course southerly, but the sides of the bay are also exposed respectively east and west.

Elevation.—Maximum 6,300 feet, minimum 4,500 feet, mean 5,500 feet.

Soil.—Sandy, free, generally dry, never very deep, resting on freely-fissured sandstone; excellent for chír.

Stock.—In the middle of the bay and in depressions the forest (density 0·5) consists chiefly of bánj, mixed with *Machilus*, *Pistacia*, *Rhus*, &c. On the ridges and along the edges of the bay the density being still 0·5, the predominant species is chír with bánj; elsewhere (about one-half of entire compartment) the hillsides are dotted (density 0·2) with chír and bánj in about equal proportions. Large fellings of chír were made here in 1880. The trees are, as a rule, vigorous and well grown.

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chír	239	23,900	9,560	769	46,140	14,225	1,169	23,380	14,028	1,334	...	9,338
Oaks	96	...	8,640	154	...	6,160	338	..	5,070	448	...	1,792
Ayár and brons ...	4	...	140	11	...	198	64	...	384	178	...	267
Bál	...	...	...	...	...	...	...	...	...	...	...	...
Sain	...	...	...	...	...	...	...	...	...	...	...	...
Cypress ...	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	339	23,900	18,340	934	46,140	20,583	1,571	23,380	19,482	1,960	...	11,397

Reproduction.—The advance growth of various ages, and consisting of chír or bánj according to locality, may be represented by a coefficient of 0·3.

Grazing.—Heavy in places.

Export lines.—The compartment is traversed at its lower extremity by the Dechauri-Ramgád bridle-road, and a good footpath runs through it connecting the villages of Sabjia and Budhlákot.

Budhlákot 3.

Boundaries.—North and west, village lands of Budhlákot; east, village lands of Purána Chorsa; south, the Tikri nadi separating compartment from Jákh 8.

Area.—Seventy-one acres, of which 50 unproductive.

Configuration and aspect.—This compartment occupies the precipitous bay running up from the Tikri nadi between Budhlákot and Purána Chorsa. The aspect is southerly and the gradients are never less than 35°; in a distance of only 2,000 feet the ground falls 1,800 feet. Large landslips have occurred.

Elevation.—Maximum 5,450 feet, minimum 3,650 feet, mean 4,600 feet.

Soil.—Sandy, never deep, often superficial, mixed with large fragments of the underlying, freely-fissured, easily-disintegrating sandstone.

Stock.—The stock consists chiefly of barberry and briars with a little *Bauhinia variegata* here and there and some coppice bushes of bánj. The whole of this compartment threatens to slip down into the valley below. On this account and on that of the wretched nature of the stock no enumeration survey has been made here.

Budhlákot 4.

Boundaries.—North and west, partly a short spur separating compartment from Budhlákot 5, partly village lands of Káphalta and of Purána Chorsa and Budhlákot 7; south and east, the Jákh nadi, chaks Shera and Chorsa, and the Tikri nadi.

Area.—Three hundred and thirty-six acres, of which 150 unproductive.

Configuration and aspect.—This compartment stretches for nearly two miles along the left bank of the Jákh nadi; being situated on the lower portion of the steep and rugged slopes, the upper part of which is occupied by the village lands of Káphalta and Purána Chorsa. These slopes are scarped out into deep bays and channels, which change the general easterly outlook into southerly and northerly aspects alternately. The gradients are never less than 35°, and scarps abound.

Elevation.—Maximum 4,600 feet, minimum 3,400 feet, mean 4,100 feet.

Soil.—Sandy, nearly always superficial, exposing the underlying, freely-fissured sandstone. Unsuited for any valuable forest growth.

Stock.—The stock, with a density of about 0·5, consists chiefly of *Bauhinia variegata*, the more valuable species being almost entirely absent. Owing to the inferior stock and the steepness of the ground, no enumeration survey has been made.

Grazing.—Only along the edge of the compartment, the slopes being too steep elsewhere.

Export lines.—There are no roads or paths in the compartment itself, but the Naini Tál-Ránikhet bridle-road runs along the opposite bank of the Jakh nadi.

Budhlákot 5.

Boundaries.—North and west, the Udária raula separating compartment from Budhlákot 6; east, the Jákh nadi, forming outer boundary of the forest; south, village lands of Kaphalta.

Area.—Eighty-two acres, of which 30 unproductive.

Configuration and aspect.—This compartment sits astride the spur which is wedged in between the Jákh nadi and the Udária raula at their junction. The gradients are everywhere steep (20° to 40°) and the ground is generally rugged and broken.

The aspect changes from easterly to northerly and southerly, according to the varying contours.

Elevation.—Maximum 3,850 feet, minimum 3,300 feet, mean 3,600 feet.

Soil.—Sandy, dry, never deep, moderately good for chír, resting on freely-fissured, easily-disintegrating sandstones.

Stock.—At the south-east extremity (one-third of compartment), the density being 0 2, the forest growth consists of a few small chír with a sprinkling of bánj, brons, and ayár, and *Bauhinias* (*retusa* and *variegata*) and sándhan. Elsewhere the density is about 0·3, the stock being composed chiefly of chír of medium vigour, with a little bánj in mixture along the upper part of the compartment, and phányath along the bottom.

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chír ...	62	6,200	2,480	127	7,620	3,175	218	4,360	2,616	229	...	1,603
Oaks ...	11	...	990	20	...	800	51	...	765	127	...	508
Ayár and brons ...	...	...	.	1	..	18	3	...	18	44	. .	66
Sál ...	...	...	...	...	...	...	...	...	..	...	...	..
Sain ...	2	100	110	...	...	. .	19	152	190	54	...	324
Cypress ...	...	...	...	...	...	...	...	...	...	...	...	...
Total	75	6,300	3,580	148	7,620	3,993	291	4,512	3,589	454	...	2,501

Reproduction.—The average coefficient of completeness is about 0·3. The advance growth consists mainly of chír poles and bánj bushes.

Grazing.—Heavy in places near village lands.

Export lines.—There are no roads or paths in the compartment itself, but the Naini Tál-Ránikhet bridle-road runs along the opposite bank of Jukh nadi.

Budhlákot 6.

Boundaries.—North, the Bárgal raula, forming outer boundary of the forest; east and south, the Udária raula, separating compartment from Budhlákot 5; west, village lands of Kaphalta.

Enclosed private land.—Cultivation chaks of Rítha and Udária khet, aggregating 15 acres.

Area.—A hundred and forty-eight acres, of which 40 unproductive.

Configuration and aspect.—This compartment occupies the irregularly-shaped ground enclosed between the Bárgal raula on the north, the Udária raula on the east and south, and the village lands of Káphalta on the west. The slopes are extremely rugged and steep, the gradients ranging generally from 25° to scarps. The aspect varies point to point between north-east and west.

Elevation.—Maximum 4,400 feet, minimum 3,260 feet, mean 4,000 feet.

Soil.—As in Budhlákot.

Stock.—There are numerous blanks of larger or smaller extent in this compartment. In the stocked portions the average density is about 0·4, and the forest growth consists mainly of chír of medium vigour with a slight mixture of bánj in the higher portions and phanyáth and sain along the raulas, where *Bauhinias* and sándhan also come in.

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chír ...	20	2,000	800	327	19,620	8,175	1,167	23,340	14,004	1,270	...	8,890
Oaks ...	13	...	1,170	40	...	1,600	186	...	2,790	542	...	2,168
Ayár and brons ...	1	...	35	...	...	...	3	...	18	72	...	108
Sál ...	...	...	...	...	...	...	...	...	...	...	...	...
Sain ...	1	50	55	4	120	80	20	160	200	79	...	474
Cypress ...	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	35	2,050	2,060	371	19,740	9,855	1,376	23,500	17,012	1,963	...	11,640

Reproduction.—The average coefficient of completeness is about 0·3. The advance growth consists of young bánj coppice, which is fairly abundant in places in the upper portion of the compartment, of a sprinkling of chír seedlings nearly everywhere, and of spare clumps of poles of the same species here and there.

Grazing.—Heavy in the vicinity of the village lands.

Export lines.—In this respect the compartment is much worse off than Budhlákot 5.

Budhlákot 7.

Boundaries.—North and east, village lands of Kaphalta ; south, village lands of Káphalta and Budhlákot ; west, prominent spur separating compartment from Budhlákot 8.

Enclosed private lands.

A chak of Káphalta	1 acre.
Ditto Budhlákot	1 „

Area.—A hundred and seventy-two acres, of which 30 unproductive.

Configuration and aspect.—This compartment is situated astride the mountain's back, so that many different aspects occur. The southern third looks entirely east, while in the rest of the compartment the predominating outlook is northerly. A small portion of the drainage goes directly into the Jákh nadi, the remainder, through numerous watercourses, into the Udária raula, itself a tributary of that nadi. Except near the top of the compartment, where the slopes are fairly easy, the gradients generally exceed 35°.

Elevation.—Maximum 6,200 feet, minimum 4,550 feet, mean 5,300 feet.

Soil.—A free, sandy loam, of varying depth, but usually fairly deep, moist, covered with rather tall grass under chír ; resting on shales or freely-fissured friable sandstones ; excellent for chír or bánj according to situation.

Stock.—The stock is very varied. The south-east corner of the compartment is rather bare (density 0·2), and is dotted chiefly with low bushes of inferior species. The north-east corner is well stocked (density 0·7) with fairly vigorous bánj mixed with ayár and brons, a few chír and a great many káphal. In the south-west corner there is a mixed forest (density 0·5) of bánj, chír, brons, and ayár, most of the trees crooked, stunted, and unsound. The crest of the mountain is covered (0·7) with a young pole forest of chír, which was severely attacked by the red fungus at the time of our visit (May, 1881). Elsewhere (mainly northerly exposures) the stock consists of scattered trees and patches of chír accompanied by brons and inferior species.

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chír ...	44	4,400	1,760	162	9,720	4,050	314	6,280	3,768	1,025	...	7,175
Oaks ...	424	...	38,160	560	...	22,400	1,039	...	15,385	4,018	...	16,072
Ayár and brons ...	5	...	175	31	...	558	142	...	852	786	...	1,179
Sál ...	...	...	...	...	...	...	...	...	...	...	...	...
Sain ...	...	...	...	...	...	...	...	...	...	...	...	...
Cypress ...	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	473	4,400	40,095	753	9,720	27,008	1,495	6,280	20,205	5,829	...	24,426

Reproduction.—The best advance growth is to be found in the bánj forest in the north-east corner of the forest, where, however, much of the growth is kept down in the state of bushes by the cowherd and his cattle (coefficient of completenes, 0·5). Chír is fairly abundant (0·4) on all northerly aspects.

Grazing.—Heavy in most places.

Export lines.—Numerous cattle-tracks and footpaths traverse the compartment, and steep footpaths connect it with the Dechauri-Rámgád and Naini Tál-Ránikhet bridle-roads.

Budhlákot 8.

Boundaries.—North and west, partly a well-defined spur and partly the Udária raula, separating the compartment from Budhlákot 9; east, village lands of Káphalta and a prominent spur, separating compartment from Budhlákot 7; south, partly village lands of Budhlákot, partly a sharp ridge separating compartment from Budhlákot 3.

Area.—A hundred and fifty-two acres, of which 30 unproductive.

Configuration and aspect.—With the exception of about 16 acres of southerly slopes just above Budhlákot, this compartment occupies the basin of a stream which drains the western half of the northern face of the great Budhlákot ridge into the Udária raula. Owing to the funnel shape of the basin, its right and left sides look respectively west and east. The slopes are more or less even and have an average gradient of about 40°.

Elevation.—Maximum 6,200 feet, minimum 4,600 feet, mean 5,550 feet.

Soil.—As in Budhlákot 7.

Stock.—Along the edges of the basin and the crests of spurs and on the upper drier slopes the forest consists principally of well-grown, vigorous chír with a density of about 0·6. Elsewhere, a few open spaces excepted, we find mixed bánj and brons, with scattered ayár and other trees, giving a density of about 0·7; the whole stock generally in a flourishing condition, save in the neighbourhood of the fields of Káphalta.

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chír ...	90	9,000	3,600	449	26,940	11,225	997	19,940	11,964	2,155	...	15,085
Oaks ...	457	...	41,130	635	...	25,400	856	...	12,840	1,602	...	6,408
Ayár and brons ...	44	...	1,540	185	...	3,330	844	...	5,064	3,004	...	4,506
Sál ...	...	...	...	...	...	...	...	...	...	...	...	...
Sain ...	...	...	...	...	...	...	...	...	...	...	...	...
Cypress ...	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	591	9,000	46,270	1,269	26,940	39,955	2,697	19,940	29,868	6,761	...	25,999

Reproduction.—The advance growth of chír consists chiefly of saplings and small poles, young seedlings being rare. The coefficient of completeness is in chír forest about 0·3, in oak and brons forest 0·5.

Grazing.—Light.

Export lines.—None exist, although they can be easily made going round through Budhlákot 7 and Purána Chórsa to the old Naini Túl-Ránikhet birdle-road.

Budhlákot 9.

Boundaries.—North and west, a long prominent spur separating compartment from Budhlákot 10 and 11 ; east and south, partly village lands of Káphalta, partly the Udária raula, and a well-marked spur separating compartment from Budhlákot 2 and 8.

Area.—A hundred and thirty five acres, of which 25 unproductive.

Configuration and aspect.—This compartment occupies the left half of the basin formed by the head-waters of Udária raula immediately above the village of Káphalta. The ground is very steep (30° to 50°) and rugged owing to the numerous feeders of the raula which form deep ravines and gullies. The main aspect is south-easterly, but the sides of some of the larger spurs look east or north.

Elevation.—Maximum 6,300 feet, minimum 4,700 feet, mean 5,000 feet.

Soil.—Sandy, never very deep, but overlying freely-fissured and easily disintegrating sandstone ; excellent for chír and bánj according to situation.

Stock.—The average density is about 0·9. With the exception of the upper end of the plot and the neighbourhood of the Udária raula, where bánj predominates mixed with brons and ayár, chír, young and of excellent growth, is nearly pure everywhere. Phanyáth puts in an appearance at the bottom of the compartment near the raula.

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chír ...	38	3,800	1,520	398	23,880	9,950	1,962	39,240	23,544	4,234	...	29,638
Oaks ...	108	...	9,720	322	...	12,880	632	...	9,480	1,293	...	5,172
Ayár and brons ...	9	...	315	62	...	1,116	233	...	1,398	1,932	...	2,898
Sál ...	...	...	...	...	...	...	...	...	...	...	...	...
Sain ...	...	...	...	...	...	...	...	...	...	...	...	...
Cypress ...	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	155	3,800	11,555	782	23,880	23,946	2,827	39,240	34,422	7,492	...	37,708

Reproduction.—There is very little room for new reproduction. Saplings and unclassed poles of chír, bánj, &c., are rapidly pushing up to complete the leaf canopy.

Grazing.—Heavy in the vicinity of Káphalta.

Export lines.—A footpath running along the northern and western boundary of the compartment and traversing its western extremity climbs up over the Budhlákot ridge and connects it with the Dechauri-Ramgád bridle-road in the valley of the Tikri nadi. With the most favourable line of road, the shortest distance to Naini Tal station will exceed five miles over very steep gradients.

Budhlákot 10.

Boundaries.—North and east, partly outer boundary of the forest, partly village lands of Káphalta; south, partly a prominent spur separating compartment from Budhlákot 9, partly a short, ill-defined spur separating it from Budhlákot 11; west, the Kalwagád, forming outer boundary of the forest.

Area.—A hundred and thirty-six acres, of which 30 unproductive.

Configuration and aspect.—This compartment occupies the lower right-hand portion of the basin of the Kalwagád, as well as the head of the bay formed by the Bárgal raula up to the boundary of Káphalta. Immediately below the watershed line occur small level expanses that were formerly under cultivation; otherwise the slopes are rather steep, the average gradient being 30°. In the eastern half of the compartment, which looks north, the ground is, moreover, rugged. The western half has a westerly aspect.

Elevation.—Maximum 5,852 feet, minimum 4,000 feet, mean 4,700 feet.

Soil.—As in Budhlákot 9.

Stock.—The average density is 0·9. Chír, young and of excellent growth, and flourishing bánj easily predominate, the former chiefly on the spurs and along the line of watershed, where it occurs almost pure, the latter principally in the hollows along the Kalwagád. Brons and ayár are fairly plentiful.

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chír ...	19	1,900	760	346	20,760	8,650	2,374	47,480	28,488	2,410	...	16,870
Oaks ...	92	...	8,280	305	...	12,200	1,064	...	15,960	2,864	...	11,456
Ayár and brons ...	3	...	105	21	...	378	177	...	1,062	1,793	...	2,689
Sál ...	...	...	...	...	...	...	...	...	...	...	...	...
Sain ...	...	...	...	...	...	...	...	...	...	...	...	...
Cypress ...	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	114	1,900	9,145	672	20,760	21,238	3,615	47,480	45,510	7,067	...	31,015

Reproduction.—As in Budhlákot.

Grazing.—*Nil.*

Export lines.—This compartment is even worse off than Budhlákot 9.

Budhlákot 11.

Boundaries.—North and west, the Kalwagád, forming outer boundary of the forest; east and south, partly an ill-defined spur separating compartment from Budhlákot 10, partly a prominent ridge separating it from Budhlákot 1, 2 and 9.

Area.—A hundred and thirty-eight acres, of which 35 acres unproductive.

Configuration and aspect.—This compartment, stretching for about a mile along the outer boundary of the forest, occupies the right-hand portion of the head of the Kalwagád basin. The ground is furrowed by small feeders of the gád in question, these feeders becoming numerous in the lower or northern half of the compartment, which is thereby rendered very rugged. The aspect is almost entirely northerly. The gradients nearly everywhere exceed 30°.

Elevation.—Maximum 7,300 feet, minimum 4,308 feet, mean 5,300 feet.

Soil.—As in Budhlákot 9.

Stock.—The general density is about 0·9, and there is scarcely a single blank, even of limited extent. Chír, of excellent growth and mostly young, predominates on the spurs, knolls, and ridges, while oaks, with an extremely large proportion of brons and ayár, all of vigorous growth, stock the rest of the compartment, in many places completely. The chief oak is bánj, tilonj being limited to the higher points of the compartment and phanyáth to the lowest portions along the Kalwagád.

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chír ...	11	1,100	440	139	8,340	3,475	834	16,680	10,048	1,763	...	12,341
Oaks ...	359	...	32,310	425	...	17,000	871	...	13,065	1,508	...	6,032
Ayár and brons ...	122	...	4,270	245	...	4,410	1,190	...	7,140	6,530	...	9,795
Sál ...	...	...	...	...	...	...	...	...	...	...	...	...
Sain ...	...	...	...	...	...	...	...	...	...	...	...	...
Cypress ...	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	492	1,100	37,020	809	8,340	24,885	2,895	16,680	30,253	9,801	...	28,168

Reproduction.—There is very little room for new growth, but numerous saplings and unclassed poles of the various species are coming on well.

Grazing.—*Nil.*

Export lines.—A steep narrow footpath connects this compartment with Budhlákot village, but the nearest point of the compartment is quite 7 miles from Naini Tal station.

CHAPTER VI.—JÁKH BLOCK.

Boundaries.—North, the Tikri nadi and one of its feeders, the Binaik raula separating the block from the Budhlákot block and the village lands of Sabjia, Budhlákot and Purána Chorsa; east, village lands of Jákh and the Jákh nadi separating it from the Bhawáli block; south, the Naini Tal settlement; west, Chína block, the line of separation being principally well-defined ridges, and partly the road from Ratghát.

Enclosed private estates.—Only a single small plot of 4 acres, Gangol, on its northern border opposite Sabjia.

Area.—Two thousand one hundred and twenty-one acres, of which 560 unproductive.

Number of component compartments.—12.

Configuration and aspect.—This block occupies nearly the whole of the very steep and rugged ridges, spurs and slopes of the entire basin between the Tikri and Jákh nadis. The fall of the ground is mainly to the north, with shelter on the south behind the lofty Chína ridge.

Elevation.—Maximum 8,626 feet, minimum 4,000 feet, mean 5,600 feet.

Soil.—The soil is generally a sandy loam of very variable depth and richness according to the locality and gradient. The backbone of the Chíua and Chhatráni ridges is formed of krol limestone, while shales and schistose and other sandstones compose the main mass of the slopes and lesser ridges. Trap crops out on the slopes below the main watershed line. Excellent soil for oak or chír according to the elevation and aspect, but requires to be under forest, as it is liable to be overrun with strong weeds and dense shrubby undergrowth.

Stock.—The upper half of the compartment is under oaks with their usual broad-leaved allies. Kharsu abounds above 7,000 feet, and bánj below this, while tilonj with a little riánj occupies the middle ground on the moister slopes. A large proportion of this oak forest on the west is in excellent condition, but on the east large landslips have taken place and the slopes below Káhla are comparatively bare.

In the lower half of the compartment pure chír forest covers all the spurs and open ground, while banks of oak and moisture-loving broad-leaved species extend along the ravines and foot of the slopes. The chír is in many places of excellent growth, but on the whole the trees are stunted and deformed owing to their isolated position. The slopes here are very steep and the hillsides are liable to slip.

Reproduction in oak forest is on the whole very fair, but young pine is not abundant enough.

The Chhatráni and Káhla plantations are situated in this block.

The following statement gives, compartment by compartment, the results of the enumeration surveys :—

Species.	Diameter-class.	Compartment 1, area 71 acres.		Compartment 2, area 105 acres.		Compartment 3, area 921 acres.		Compartment 4, area 70 acres.		Compartment 6, area 167 acres.		Compartment 6, area 188 acres.	
		Gross number of trees.	Number of trees per acre.	Gross number of trees.	Number of trees per acre.	Gross number of trees.	Number of trees per acre.	Gross number of trees.	Number of trees per acre.	Gross number of trees.	Number of trees per acre.	Gross number of trees.	Number of trees per acre.
Chír ...	I.	54	0·76	6	0·05	...	...	5	0·06	145	0·87	124	0·66
	II.	86	1·21	5	0·04	...	...	3	0·04	95	0·57	187	0·99
	III.	74	1·04	3	0·02	...	...	6	0·08	194	1·16	469	2·49
	IV.	536	7·54	16	0·15	...	...	23	0·32	481	2·88	3,970	21·11
Totals ...		750	10·56	30	0·27	...	...	37	0·52	915	5·47	4,750	25·26
Phanyát ...	I.	...	...	...	...	...	...	...	...	...	...	...	...
	II.	...	...	...	...	...	...	...	...	...	...	...	...
	III.	...	...	...	...	...	...	...	...	...	...	...	...
	IV.	...	...	...	...	...	...	...	...	...	...	4	0·02
Totals ...		...	...	...	...	...	...	...	...	...	...	4	0·02
Bánj ..	I.	189	2·66	57	0·54	...	...	171	2·44	285	1·70	181	0·96
	II.	207	2·93	147	1·40	...	...	83	1·18	229	1·37	231	1·22
	III.	293	4·12	283	2·69	...	...	63	0·90	337	2·02	628	3·34
	IV.	309	4·35	561	5·34	...	...	212	3·02	685	4·10	2,522	13·41
Totals ...		998	14·05	1,048	9·98	...	...	529	7·55	1,536	9·10	3,562	18·94
Tilonj ...	I.	9	0·12	...	...	...	...	94	1·33	...	...	1	...
	II.	4	0·05	...	...	...	...	119	1·69	...	...	2	0·01
	III.	...	...	...	...	...	...	141	2·01	...	...	3	0·01
	IV.	21	0·29	...	...	...	...	303	4·32	...	...	7	0·03
Totals ...		34	0·48	...	...	...	...	657	9·38	...	...	13	0·06
Riánj ...	I.	...	...	...	...	...	...	...	...	...	...	...	...
	II.	...	...	...	...	...	...	...	...	...	...	...	...
	III.	...	...	...	...	...	...	...	...	...	...	...	...
	IV.	...	...	...	...	...	...	...	...	...	...	...	...
Totals ...		...	...	...	...	...	...	...	...	...	...	...	...
Khársu ...	I.	...	...	...	...	...	...	49	0·70	...	...	...	...
	II.	...	...	...	...	...	...	79	1·12	...	...	...	...
	III.	...	...	...	...	...	...	156	2·22	...	...	...	...
	IV.	...	...	...	...	...	...	176	2·51	...	...	...	...
Totals ...		...	...	...	...	...	...	460	6·56	...	...	...	...
Ayár ...	I.	67	0·94	2	0·01	...	...	10	0·14	10	0·05	9	0·04
	II.	9	0·12	1	...	...	...	35	0·50	43	0·25	19	0·10
	III.	64	0·90	64	0·60	...	...	199	2·84	61	0·36	87	0·46
	IV.	58	0·81	13	0·12	...	...	949	13·55	257	1·54	276	1·46
Totals ...		198	2·78	80	0·76	...	...	1,193	17·14	371	2·22	391	2·08
Brons ...	I.	86	1·21	2	0·01	...	...	238	3·40	105	0·63	48	0·25
	II.	27	0·38	16	0·15	...	...	364	5·20	113	0·67	106	0·56
	III.	107	1·50	70	0·66	...	...	797	11·39	450	2·70	234	1·24
	IV.	122	1·71	68	0·64	...	...	1,597	22·81	618	3·70	352	1·87
Totals ...		342	4·81	156	1·48	...	...	2,996	42·80	1,286	7·70	740	3·93
GRAND TOTALS,		...	...	...	...	...	...	...	...	...	...	...	...

Compartment 7, area 145 acres.		*Compartment 8, area 487 acres.*		*Compartment 9, area 155 acres.*		*Compartment 10, area 151 acres.*		*Compartment 11, area 167 acres.*		*Compartment 12, area 93 acres.*		*Entire block, area 212 acres.*	
Gross number of trees.	Number of trees per acre.	Gross number of trees.	Number of trees per acre.	Gross number of trees.	Number of trees per acre.	Gross number of trees.	Number of trees per acre.	Gross number of trees.	Number of trees per acre.	Gross number of trees.	Number of trees per acre.	Gross number of trees.	Number of trees per acre.
8	0·06	...	...	28	0·18	318	2·11	193	1·16	...	...	881	0·41
11	0·07	...	...	30	0·19	419	2·77	292	1·75	...	...	1,128	0·53
16	0·11	...	...	12	0·07	608	4·03	233	1·40	...	...	1,615	0·76
154	1·06	...	...	20	0·13	722	4·78	197	1·18	...	...	6,119	2·88
189	1·30	...	...	90	0.58	2,067	13·69	915	5·49	...	...	9,743	4·59
...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	4	...
...	...	...	...	...	...	...	...	...	...	...	...	4	...
361	2·51	...	...	410	2·64	279	1·85	245	1·47	...	...	2,181	1·47
349	2·40	...	...	278	1·79	351	2·32	212	1·27	...	...	2,087	0·98
631	4·35	...	...	419	2·70	481	3·18	221	1·32	...	...	3,356	1·58
1,390	9·58	...	...	547	3·52	565	3·74	191	1·14	...	...	6,912	3·29
2,734	18·85	...	...	1,654	7·67	1,676	11·10	869	5·20	...	...	14,606	6·87
89	0·61	...	...	127	0·82	5	0·03	23	0·14	...	...	348	0·16
85	0·58	...	...	106	0·68	7	0·05	19	0·11	...	...	342	0·16
142	0·97	...	...	183	1·18	17	0·11	25	0·15	...	...	511	0·24
312	2·15	...	...	388	2·50	16	0·11	35	0·21	...	...	1,082	0·51
628	4·31	...	...	804	5·18	45	0·30	102	0·61	...	...	2,283	1·07
...	...	...	...	78	0·50	58	0·38	171	1·04	...	...	307	0·14
...	...	...	...	62	0·40	51	0·35	265	1·59	...	...	378	0·18
...	...	...	...	80	0·51	62	0·41	228	1·36	...	...	370	0·18
2	0·01	...	...	114	0·73	89	0·59	234	1·40	...	...	439	0·20
2	0·01	...	...	334	2·15	260	1·72	898	5·39	...	...	1,494	0·70
158	1·09	...	...	48	0·30	...	...	3	0·02	...	...	258	0·12
162	1·11	...	...	69	0·52	...	...	4	0·02	...	...	314	0·14
195	1·35	...	...	102	0·65	...	...	7	0·04	...	...	460	0·21
305	2·10	...	...	83	0·53	...	...	5	0·03	...	...	569	0·27
820	5·65	...	...	302	1·94	...	...	19	0·11	...	...	1,601	0·75
98	0·67	...	...	75	0·48	67	0·45	43	0·26	...	...	381	0·17
173	1·19	...	...	164	1·05	63	0·42	109	0·65	...	...	616	0·29
532	3·66	...	...	456	2·94	144	0·95	282	1·69	...	...	1,889	0·89
1,308	9·02	...	...	1,509	9·73	220	1·45	636	3·81	...	...	5,226	2·46
2,111	14·15	...	...	2,204	14·21	494	3·27	1,070	6·41	...	...	8,112	3·82
417	2·87	...	...	617	3·98	212	1·40	205	1·23	...	...	1,930	0·90
572	3·94	...	...	876	5·65	350	2·36	727	4·35	...	...	3,157	1·48
1,268	8·74	...	...	2,162	13·94	681	4·51	1,195	7·16	...	...	6,964	3·28
3,028	20·88	...	...	3,774	24·34	1,332	8·16	1,602	9·59	...	...	12,893	5·84
5,285	36·44	...	...	7,429	47·91	2,481	16·43	3,729	22·33	...	...	24,444	11·52
...	...	...	...	...	...	...	...	...	...	...	...	62,287	29·36

Grazing.—Heavy in the neighbourhood of Jákh village lands and near Pangot. Elsewhere all but absent.

Export lines.—Being adjacent to the station, the block is very easily accessible, but with the exception of a new bridle road from Mauláni to Chungi chauki and a short length of the China road-behind "Fairlight Hall," no good communications exist, although they could be easily made whenever required.

Jákh 1

Boundaries—North, Buderi raula, separating compartment from Jákh 5; east, Jákh nadi, separating it from Laria Kánta 10 and 11; south, Naini Tál municipality; west, spur separating compartment from Jakh 2.

Area.—Seventy-one acres, of which 20 acres unproductive.

Configuration and aspect.—This compartment is situated in the deep narrow valley in the bottom of which the Jákh nadi flows. It is enclosed on all sides by much higher ground and is thus completely sheltered. The slopes are very steep (35° to 60°) and fall mainly from north to south; but half of them look also north and half east.

Elevation.—Maximum 6,300 feet, minimum 5,100 feet, mean about 5,700 feet.

Soil and underlying rock.—Soil sandy, slightly loamy, and containing a fair quantity of humus in the hollows; of very variable depth, often absent, exposing the underlying shales and shaly schistose sandstone, which latter sometimes runs into quartzitic rock; excellent for bánj and chír.

Stock.—The stock is fairly complete (average density 0·7), but very variable as regards distribution of species: bánj and brons in the depressions and hollows, chír along the crests of spurs. Both the bánj and chír, especially the former, are of vigorous growth and attain a good size. Maples and alders are plentiful along the Jákh nadi and on the higher ground tilonj occurs. Blanks of limited extent are not uncommon.

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of Timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chír ...	54	5,400	2,160	86	5,160	2,150	74	1,480	888	336	...	3,752
Oaks ...	198	...	17,820	211	...	8,440	293	...	4,395	330	...	1,320
Ayár and brons ...	153	...	5,355	36	...	648	171	...	1,026	180	...	270
Total ..	405	5,400	25,335	333	5,160	11,238	538	1,480	6,309	846	...	5,342

Reproduction.—Uncounted poles of banj are numerous, but recent reproduction by seed is extremely backward, owing principally to the steep gradients. Mean co-efficient 0·3.

Grazing.—Slight.

Export lines.—The old Naini Tál-Ránikhet bridle-road traverses it in two places.

Jákh 2.

Boundaries.—North, Buderi raula, separating compartment from Jákh 5; east, spur separating it from Jákh 1; south, Naini Tál municipality; west, sot separating compartment from Jákh 3.

Area.—A hundred and five acres, of which 25 unproductive.

Configuration and aspect.—This compartment occupies the north-westerly slopes which descend from the municipal boundary near the Naini Tál-Ránikhet bridle-road to the Buderi raula, at first with easy gradients (15° to 25°), but, on approaching the raula, rapidly (30° to 45°). A long but shallow ravine running north-west divides the compartment into two nearly equal portions.

Elevation.—Maximum 6,770 feet, minimum 5,300 feet, mean about 5,900 feet.

Soil and underlying rock.—A sandy loam of variable depth, rich in the ravines, always mixed up with a more or less large proportion of fragments of the underlying alternating shales and schistose sandstones, which crop out here and there on the steep slopes overhanging the Buderi raula; excellent for bánj.

Stock.—The ravines and the vicinity of the Buderi raula (about two-fifths of the whole compartment) are fairly well (density 0·5 to 0·7) stocked with bánj forest containing only a very slight mixture of other species. The top of the compartment is fringed with bánj almost pure, chiefly fine old trees. Otherwise the ground is extremely bare of forest vegetation, which is generally kept down by a dense growth of *Indigofera*, brambles and other thorny shrubs. Here and there, however, patches of bánj and rhododendron forest occur. The poverty of the stock is due to former extensive cultivation.

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chír ...	6	600	240	5	300	125	3	60	36	16	...	112
Oaks ...	57	...	5,130	147	...	5,880	283	...	4,245	561	...	2,244
Ayar and brons ...	4	...	140	17	...	306	124	..	804	81	...	121½
Total ...	67	603	5,510	169	300	3,311	420	60	5,085	658	...	2,477½

Reproduction.—The reproduction is extremely backward owing to the dense undergrowth described above. But in the ravines and near the Buderi raula uncounted poles and young coppice of bánj and rhododendron are fairly abundant, and the ground is too well covered to admit of new reproduction by seed on any considerable scale.

Grazing.—*Nil.*

Export lines.—*Nil.*

Jákh 3.

Boundaries.—North, partly a small spur, separating compartment from Jákh 4, partly the Buderi raula, separating it from Jákh 4 and 5; east, a small feeder of that raula, separating it from Jákh 2; south, continuation of the great Chína ridge and a foot-road separating compartment from Naini Tál settlement; west, the Chína ridge separating it from Chína 4 and a well-marked offshoot of the ridge separating it from Chína 12.

Area.—Three hundred and twenty-eight acres, of which 90 unproductive.

Configuration and aspect.—This large compartment occupies the very steep, and in most instances rugged and precipitous slopes immediately at the back of the Naini Tál settlement. Landslips are numerous and of frequent occurrence.

Elevation.—Maximum 8,626 feet, minimum 5,500 feet, mean about 7,000 feet.

Soil and underlying rock.—Soil, where it exists, a free, sandy, generally rich loam; very frequently absent, exposing the underlying shales and much contorted, thinly-bedded sandstone, containing interbedded trap. Krol limestone crops out in places along the crest of the Chína ridge and its continuation and offshoots. Excellent soil, wherever it exists, for oak forest, mixed or pure.

Stock.—The greater portion of this compartment is blank or almost treeless, owing to the steep poles and numerous landslips. Where there is forest, this consists chiefly of oaks, pure or mixed, with brons and ayár and miscellaneous species; the oaks being khársu, tilonj or bánj, according to the elevation, and the trees are usually vigorous. A few cypresses of moderately good growth are found here and there on very steep faces.

Summary of valuation.—Obviously no enumeration survey has been made.

Reproduction.—Extremely good in patches, but generally very backward or almost hopeless.

Grazing.—*Nil.*

Export lines.—A picnic road from "Fairlight Hall" to Chína and the Maulani forest bridle-road traverse the western extremity of the compartment.

Jákh 4.

Boundaries.—North Chhatráni ridge, separating compartment from Jákh 7; east, spur, separating it from Jákh 5; south, Buderi raula separating it from Jákh 3; west, spur, separating it from Jákh 3 and Chína 13.

Area.—Seventy acres, of which 15 unproductive.

Configuration and aspect.—This compartment occupies the southerly slopes running down from the Chhatráni ridge to the Buderi raula opposite the Chína peak. The gradients are very uniform, ranging between 25° to 35°, and the contours of the slopes are regular.

Elevation.—Maximum 8,050 feet, minimum 6,000 feet, mean about 7,000 feet.

Soil and underlying rock.—A sandy loam, never deep, containing a large proportion of fragments of all sizes of the underlying shales and shaly sandstones; good for bánj and rhododendron forest.

Stock.—The stock is very open (average density 0·4), and consists principally of brons with varying proportions of ayar and the oaks—bánj, kharsu and tilonj; bánj being the most numerous of these three species, the other two being confined to the higher portions of the compartment (the gullies excepted) and to the Chhatráni ridge; the trees are stunted and far from vigorous. Chír just puts in an appearance at the southern extremity of the compartment.

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chír ...	5	500	200	3	180	75	6	120	72	23	...	161
Oaks ...	314	...	28,260	281	...	11,240	360	...	5,400	691	...	2,764
Ayar and brons ...	248	...	8,680	399	...	7,182	996	...	5,976	2,546	...	3,819
Total ...	567	500	37,140	683	180	18,497	1,362	120	11,448	3,260	...	6,744

Reproduction.—Young coppice is abundant in the neighbourhood of seed-bearers, but present reproduction by seed is rare. Average co-efficient 0·5.

Grazing.—Nil.

Export lines.—The new Mauláni-Naini Tál forest bridle-path traverses the western extremity of the compartment from north to south, and a foot-path, coming from Fairlight Hall, similarly passes through its eastern end.

Jákh 5.

Boundaries.—North, spur separating compartment from Jákh 6 and 7; east, Jákh nadi separating it from Laria Kánta 11; south, Buderi raula separating it from Jákh 1, 2, and 3; west, spur and Buderi raula separating it from Jákh 3 and 4.

Area.—167 acres, of which 40 unproductive.

Configuration and aspect.—This compartment occupies the slopes on the left of the Buderi raula from its junction with the Jákh nadi upwards. They are drained principally by a large sot flowing eastwards to meet that raula. The gradients are nearly everywhere steep, ranging from 35° to 50°, and the contours are more or less irregular. The main fall of the ground is from west to east, but one-third of the compartment is also turned south.

Elevation.—Maximum 7,143 feet, minimum 5,000 feet, mean about 5,900 feet.

Soil and underlying rock.—A sandy loam, deep and fairly rich in the numerous ravines and gullies, more or less shallow elsewhere, containing a large proportion of fragments of sizes of the underlying alternating shales and sandstone, the latter of which, though generally schistose, is not unfrequently quartzitic; soil generally good for bánj, brons, and chír.

Stock.—The neighbourhood of the Buderi raula, the sides of the main sot and the numerous small ravines and gullies (about a tenth of the whole compartment) are well stocked (density 0·7) with bánj and brons forest containing a sprinkling of ayár and chír. The bánj everywhere indicates severe lopping in the past. Elsewhere the ground is extremely bare, the density of the stock varying from 0·1 to 0·3, the worst portions being situated in the middle of the compartment. Where the chír has been given any chance, it is vigorous and of tall habit. The extreme poverty of the stock is due to extensive cultivation in former times.

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chír ...	145	14,500	5,800	95	5,700	2,375	194	3,880	2,328	481	...	3,367
Oaks ...	285	...	25,050	299	...	9,160	337	...	5,055	685	...	2,740
Ayár and brons ...	115	...	525	156	...	2,808	511	...	3,066	875	...	1,312
Total ...	545	14,500	31,375	550	5,700	14,343	1,042	3,880	10,449	2,041	...	7,410

Reproduction.—Considering the large extent of the blanks, reproduction, especially of chír, is making rapid progress (co-efficient 0·5); uncounted poles and young coppice of bánj and brons are abundant.

Grazing.—Light.

Export lines.—A foot-path from Chhatráni Dhár to Káhála, easily convertible into a bridle-path, bisects the compartent from north to south.

Jákh 6.

Boundaries.—North, spur separating compartment from Jákh 8 and village lands of Jákh ; east, Jákh nadi separating compartment from Bhawáli 12 ; south, spur separating it from Jákh 5 ; west, spur separating it from Jákh 7.

Area.—188 acres, of which 50 unproductive.

Configuration and aspect.—This compartment comprises the lower half of the steep basin of a large feeder of the Jákh nadi and also the drainage basin of two or three small sots. With few exceptions, the ground is extremely rugged and steep (gradients 35° to 50°). The general aspect is easterly, but the slopes forming the left side of the main basin look partially south-east.

Elevation.—Maximum 6,150 feet, minimum 4,200 feet, mean about 5,100 feet.

Soil and underlying rock.—A sandy loam, seldom of any depth, sometimes, as on the left side of the main basin, exposing the underlying alternating shales of all sizes, fragments of which rocks are everywhere intermixed with the soil. Large landslips have occurred. Soil excellent for chír and bánj.

Stock.—Beginning from the bottom, we find a fairly dense (0·7) low coppice of bánj with brons, ayár, &c., covering about two-sevenths of the compartment. As we ascend chír puts in an appearance, until it becomes almost pure midway up the compartment and especially on the nothern slopes. The chír is of excellent growth, and occupies about another two-sevenths of the compartment with a density of about 0·4. Beyond this we have either blanks alternating with fine patches of chír, or, at the upper extremity of the compartment, scattered low, crooked oaks with a sprinkling of chír (density 0·1).

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chír ...	124	12,400	4,960	187	11,220	4,675	469	9,380	5,628	3,970	...	27,790
Oaks ...	182	...	16,380	233	...	9,320	631	...	9,465	2,533	...	10,132
Ayár and brons ...	57	...	1,995	125	...	2,250	321	...	1,926	628	...	942
Total ...	363	12,400	23,335	545	11,220	16,245	1,421	9,380	17,019	7,131	...	38,864

Reproduction.—In the chír area the reproduction is very good, especially on stony ground, the average co-efficient of completeness being 0·6. Advance growth of the other species in their respective localities may be represented by 0·4. Cattle have trodden the ground hard on the lower gentler slopes, where reproduction is more backward than anywhere else.

Grazing.—Heavy on the lower slopes.

Export lines.—The old Naini Tál-Ránikhet bridle-road, now much breached and out of repair, runs past the lowest edge of the compartment.

Jákh 7.

Boundaries.—North, ridge separating compartment from Jákh 8 and 9 ; east, Jákh 6 ; south, ridge separating compartment from Jákh 4 and 5 ; west, Chhatráni ridge separating it from Chína 13.

Area.—145 acres, of which 30 unproductive.

Configuration and aspect.—This compartment occupies the upper half of the hour-glass-shaped basin of an important stream which drains the easterly slopes

coming down from the Chhatráni ridge into the Jakh nadi. The sides of the basin hence look respectively north and south. Excepting a few more or less gentle slopes (15° to 30°), the ground is very rugged and extremely steep (35° to 50°).

Elevation.—Maximum 8,050 feet, minimum 5,900 feet, mean about 6,600 feet.

Soil and underlying rock.—A sandy loam ; deep on the south-easterly slopes (about one-sixth of compartment) ; deep and also rich in mould in the ravines and gullies (another sixth of compartment) ; elsewhere generally shallow, exposing along the Chhatráni ridge the underlying alternating shales and shaly sandstones. The main stream is more or less perennial. Soil excellent for bánj and brons.

Stock.—The stock consists essentially of rhododendron and oak, chiefly bánj. Kharsu is numerous above 7,000 feet, while scattered tilonj follows the ravines almost right down to the lowest point of the compartment. A little chír forest occurs on some of the southerly slopes. With the exception of a few blanks, the sites of former cultivation, or where the gradient is extremely steep and superficial, the ground is well covered (density 0·6 to 0·8). The general vegetation of the forest is very vigorous.

Summary of valuation.

Species.	Class. I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chir ...	8	800	320	11	660	275	16	320	192	154	...	1,078
Oaks ...	6,111	...	5,49,990	596	...	23,840	968	...	14,520	2,009	...	8,036
Ayár and brons,	515	...	18,025	745	...	13,410	1,800	...	10,800	4,336	...	6,504
Total ...	6,634	800	5,68,335	1,352	660	37,525	2,784	320	25,512	6,499	...	15,618

Reproduction.—The few blanks where *Indigofera* has not taken complete possession of the ground and the numerous little gaps scattered everywhere are rapidly filling up (0·6).

Grazing.—A small settlement of graziers stands at the lower end of the compartment, but, owing to the more or less complete state of the stock, the area actually grazed over is very small.

Export lines.—Two fairly good foot-paths traverse the compartment, while the new Mauláni-Naini Tál forest bridle-path passes close to its western boundary.

Jákh 8.

Boundaries.—North, the Tikri nadi separating compartment from Budhlákot 2 and 3, and village lands of Sabjia, Budhlákot, and Purána Chorsa ; east, village lands of Jákh ; south, a short spur separating compartment from Jákh 6 and 7 ; west, also a sharp spur separating compartment from Jakh 9, 10, and 11.

Area.—491 acres, of which 150 unproductive.

Configuration and aspect.—This large compartment sits astride the broad spur at the junction of the Jákh and Tikri nadis. One face of the spur (about a third of the total area) looks north, the other east or north-east ; but on each face minor spurs modify the general aspect. As a rule the slopes are not rugged, but at the end of uniform, though steep (37°), gradients they run down in precipices.

Elevation.—Maximum 7,250 feet, minimum 4,100 feet, mean about 6,000 feet.

Soil and underlying rock.—On the northern face of the main spur sheet rock of not very hard sandstone predominates. In the remaining portion of the compartment

the soil is a sandy loam, sometimes deep, but generally shallow and mixed up with fragments of the underlying shales and crumbling sandstones, which are breaking away and forming large landslips. Otherwise the soil is excellent for chír on the northern face of the main spur and on the lower slopes of the other face, and for oaks above these slopes.

Stock.—There is very well-grown chír (density 0·5) on the northern face of the main spur. We also find chír as well grown, but less abundant, on all the drier slopes of the other face up to more than half way to the top of the compartment. Elsewhere there is mixed bánj and brons forest of very variable density, complete in places, almost absent in others.

Summary of valuation.—No survey was made on account of the steep nature of the ground and of its tendency to break away in large landslips.

Reproduction.—Backward ; the average co-efficient of completeness is about 0·2.

Grazing.—Heavy in the neighbourhood of Jákh village lands.

Export lines.—The Dechauri-Rámgád and old Naini Tál-Ránikhet bridle-roads run immediately below the compartment parallel to two adjacent sides.

Jákh 9.

Boundaries.—North and east, ridges and a sot separating compartment from Jákh 7, 8, and 10 ; south and west, ridges and a sot separating it from Chína 13 and Jákh 10.

Area.—155 acres, of which 25 unproductive.

Configuration and aspect.—This compartment is situated between the two main branches of a large sot which joins the Tikri nadi opposite Sabjia. The spur which forms the watershed line between the drainage of these two branches divides the compartment into two portions, the one forming about one-third of the compartment having a northerly aspect, the other generally a north-easterly aspect, although some slopes are turned north and others west. The ground is seldom rugged, but the gradients never fall below 30° and are often precipitous. Numerous gullies furrow the hillsides.

Elevation.—Maximum 7,800 feet, minimum 5,450 feet, mean about 7,000 feet.

Soil and underlying rock.—A sandy loam, shallow and stony along crests of ridges and spurs, elsewhere rich and deep, especially in the main ravines ; resting on alternating shales and schistose sandstone. The ground seldom dries more than a foot or so from the surface. Soil excellent for brons and oak forest.

Stock.—Excluding a few blanks of very slight extent, the stock is almost complete. Kharsu is nearly pure above 7,400 feet ; mixed with it is tilonj, which also runs down into the deeper ravines, while a belt of sparse riánj crowns the ridge in the west of the compartment. With the above exceptions, the stock consists chiefly of brons forest containing a strong admixture of bánj and ayár.

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chír ...	28	2,800	1,120	30	1,800	750	12	240	149	20	...	140
Oaks ...	663	...	59,670	515	...	20,600	784	...	1,176	1,132	...	4,534
Ayár and brons ...	692	...	24,220	1,040	...	18,720	6,218	...	15,708	5,283	...	7,928
Total ...	1,383	2,800	85,010	1,585	1,800	40,070	7,014	240	27,617	6,435	...	12,602

Reproduction.—There is very little room for new reproduction. The small blanks already alluded to are generally filling up with young bánj, brons, and ayár coppice ; a few are, however, covered with a dense growth of *Indigofera.*

Grazing.—Nil.

Export lines.—Two good foot-paths traverse the compartment from north to south, one entering Naini Tál settlement at Fairlight Hall, the other at Darwán khál. The new Mauláni-Naini Tál forest bridle-path runs parallel and close to the western boundary.

Jákh 10.

Boundaries.—North and west, a prominent spur separating compartment from Jákh 11 ; east, a prominent spur separating compartment from Jákh 8; south, two branches of a stream and a short spur separating it from Jákh 9.

Area.—151 of which 30 unproductive.

Configuration and aspect.—This compartment resembles in shape the body of a man from his waist to his knees, a feeder of the Tikri nadi forming the middle line. The slopes composing the right half look west and north-west, while those comprised in the left half run down south-east. The ground is everywhere very rugged and the gradients generally exceed 30°.

Elevation.—Maximum 7,300 feet, minimum 5,000, feet, mean about 6,000 feet.

Soil and underlying rock.—On the westerly slopes as in Jákh 11 ; elsewhere the soil is rather deeper and of better quality ; generally good for chír and bánj.

Stock.—The main hollow in the middle of the compartment is well stocked (0·7), mainly with bánj and brons mixed with ayár and inferior species partial to moist localities. This kind of forest, but rather more open on the whole and admitting a small proportion of riánj and tilonj, covers the higher points of the compartment. Elsewhere the slopes are dotted (0·3) with chír of good growth.

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chír ...	318	31,800	12,720	419	25,140	10,475	608	12,160	7,296	722	...	5,054
Oak ...	342	...	30,780	409	...	16,360	560	...	8,400	670	...	2,680
Ayár and brons ...	279	...	9,765	419	...	7,542	825	...	4,950	1,452	...	2,178
Total ...	939	31,800	53,265	1,247	25,140	34,377	1,993	12,160	20,646	2,844	...	9,912

Reproduction.—Poor everywhere ; mean co-efficient of completeness 0·2.

Grazing.—Nil.

Export lines.—A steep foot-path traverses the compartment from north to south and connects it with the China-Mauláni forest bridle-road, against which also one of the legs of the compartment rests.

Jákh 11.

Boundaries.—North, the Tikri nadi separating compartment from Sabjia village and Budhlákot 1 ; east, part of a sot and a long spur separating it from Jákh 8 and 10 ; south, spurs separating it from China 13 and 14 ; west, spur separating it from Jákh 12.

Enclosed private land.—Fields of Gangol, area 4 acres.

Area.—167 acres, of which 45 unproductive.

Configuration and aspect.—This compartment occupies the very steep rugged, northerly slopes overhanging the right bank of the Tikri nadi opposite Sabjia and Dária. The gradients seldom fall below 30° and scarps are numerous. The land has slipped in many places.

Elevation.—Maximum 7,250 feet, minimum 4,800 feet, mean about 5,500 feet.

Soil and underlying rock.—A sandy soil, generally shallow, often absent, exposing the underlying freely fissured sandstone; fairly good for chír and oak where it exists.

Stock.—The stock consists chiefly of brons, ayár, and bánj, with some tilonj in the ravines and hollows and a large proportion of riánj in the upper portion of the compartment, while chír is scattered everywhere on the knolls and spurs. A few kharsu are found above 7,000 feet. The chír trees are fairly well grown.

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chír ...	199	19,300	7,720	292	17,520	7,300	233	4,660	2,796	197	...	1,379
Oak ...	442	...	39,780	500	...	20,000	481	...	7,215	465	...	1,860
Ayár and brons ...	248	...	8,680	836	...	15,048	1,477	...	8,862	2,238	...	3,357
Total ...	883	19,300	56,180	1,628	17,520	42,348	2,191	4,660	18,873	2,900	...	6,596

Reproduction.—Poor; co-efficient of completeness from 0·1 to 0·4.

Grazing.—Nil; ground too steep.

Export lines.—Nil.

Jákh 12.

Boundaries.—North, Binaik raula separating compartment from Budhlákot 1; east, a sharp spur separating it from Jákh 11; south, a well-marked spur separating it from Chína 14; west, the Dechauri-Rámgád bridle-road separating it from Chína 19.

Area.—91 acres, of which 40 unproductive.

Configuration and aspect.—With the exception of the north-west corner (about one-seventh of total area), the compartment occupies the deep glen through which the Tikri nadi flows after passing Pangot. The gradients are nearly everywhere precipitous. The slopes in the north-west corner have a northerly aspect, while those overhanging the Tikri on the left look south-east and those immediately opposite north-west.

Elevation.—Maximum 7,000 feet, minimum 5,430 feet, mean about 6,000 feet.

Soil and underlying rock.—A sandy soil, generally shallow, resting on loosely bedded sandstone which is frequently exposed; good for bánj.

Stock.—There is forest growth only in patches, and this chiefly along the Tikri, consisting mainly of bánj with brons and ayár. The trees are generally either small or young.

Summary of valuation.—No enumeration survey has been made on account of the poor stock and bad ground.

Reproduction.—Young bánj is fairly abundant in many places and some seedlings at least are met with everywhere.

Grazing.—Heavy in places accessible to cattle.

Export lines.—The Dechauri-Rámgád bridle-road forms the western boundary of the compartment.

CHAPTER VII.—CHÍNA BLOCK.

Boundaries.—North, the outer northern boundary of the forest; east, the Budhlákot and Jákh blocks and the Naini Tál settlement; south and west, outer boundary of the forest.

Enclosed private estates.—Eight separate plots, six very small, and the largest comprising only 55 acres. Aggregate area 95 acres.

Area—3,863 acres, of which 800 unproductive.

Number of component compartments.—22.

Configuration and aspect.—This block consists of two entirely separate drainage basins parted by the line of the great Chína ridge which runs down north-westwards through Pangot to Chhota Binaik. Nearly two-thirds of the area comprise the basin to the south-west of that ridge. This basin is enclosed by very high, rugged, steep and even precipitous slopes, separated by sharp spurs and narrow, deep ravines. The ground in the other basin is very much less broken, generally possesses rounded contours, but is still steep, although less so than in the other.

Elevation.—Maximum 8,626 feet, minimum about 3,900 feet, mean 6,000 feet.

Soil and underlying rock.—Generally a sandy loam, often deep and rich even on steep hill sides, overlying principally shales and to a less extent thinly bedded, easily disintegrating sandstones. The black krol limestone forms the blackbone of the main watershed ridge and the large southern spurs, and affects favourably the soil everywhere. On southern exposures, wherever the forest has been over-felled, the soil has been washed away and the ground is liable to break and slip away. The soil is everywhere excellent for oaks.

Stock.—In the southern one of the two basins overfelling for charcoal has resulted in nearly half the area being rendered bare of tree vegetation, and the steepness and crumbling nature of the hill sides will prove an extremely difficult obstacle to overcome in rewooding them. Wherever the forest has been preserved it is excellent, consisting of an almost complete stock of kharsu and a little tilonj above and bánj and its broad-leaved allies below 6,400 feet. In the other basin the steep scarps below the Chína ridge are naturally not well-wooded, and large open areas exist on the more uniform slopes, where fields existed not many years ago. Otherwise the forest, all oak, with the exception of limited bands of chír on the warm, low slopes near Bagarh, is in as good condition as the wooded portions of the first basin. Reproduction of the oaks, especially kharsu, is generally excellent wherever the forest has not been cleared. The Chína-Mauláni, Kiládhúnga, and Bhádli plantations are in this block.

The results of the enumeration survey of the stock are summarized compartment by compartment in the following statement :—

Species.	Diameter-class.	Compartment 1, area 155 acres. Gross number of trees.	Compartment 1, area 155 acres. Number of trees per acre.	Compartment 2, area 220 acres. Gross number of trees.	Compartment 2, area 220 acres. Number of trees per acre.	Compartment 3, area 134 acres. Gross number of trees.	Compartment 3, area 134 acres. Number of trees per acre.	Compartment 4, area 138 acres. Gross number of trees.	Compartment 4, area 138 acres. Number of trees per acre.	Compartment 5, area 146 acres. Gross number of trees.	Compartment 5, area 146 acres. Number of trees per acre.
Chír	I	1	0·01	...	...	...	...	...	...	...	...
	II	...	...	...	...	...	...	...	...	...	...
	III	...	...	...	...	...	...	...	...	...	...
	IV	4	0·02	...	...	...	...	...	...	...	...
Total ...	...	5	0·03	...	...	...	...	...	...	...	...
Cypress	I	...	...	...	...	...	...	...	...	...	...
	II	...	...	...	...	...	...	1	...	1	0·10
	III	...	...	...	...	...	...	...	...	12	0·08
	IV	...	...	...	...	...	...	1	0·01	20	0·13
Total ...	...	...	...	...	...	...	...	2	0·01	33	0·23
Phanyáth... ...	I	...	...	...	...	...	...	...	...	...	...
	II	...	...	...	...	...	...	...	...	...	...
	III	...	...	...	...	...	...	...	...	...	...
	IV	...	...	...	...	...	...	...	...	...	...
Total ...	...	...	...	...	...	...	...	...	...	...	...
Bánj	I	173	1·12	393	1·79	4	0·03	...	...	118	0·81
	II	215	1·38	437	1·99	15	0·11	...	...	124	0·85
	III	506	3·26	560	2·54	81	0·60	...	...	232	1·59
	IV	1,190	7·68	1,490	6·77	452	3·37	...	...	680	4·66
Total ...	...	2,084	13·44	2,880	13·09	552	4·12	...	...	1,154	7·90
Tilonj	I	34	0·22	113	0·51	53	0·40	3	0·02	11	0·07
	II	69	0·44	94	0·43	50	0·37	1	...	22	0·15
	III	288	1·86	134	0·61	121	0·90	1	...	86	0·59
	IV	530	3·42	212	0·96	660	4·92	16	0·12	264	1·79
Total ...	...	921	5·94	553	2·51	884	6·59	21	0·14	383	2·60
Riánj	I	...	...	...	...	...	...	...	...	...	...
	II	...	...	...	...	...	...	...	...	...	...
	III	...	...	...	...	...	...	...	...	...	...
	IV	...	...	...	...	1	0·01	...	...	...	...
Total ...	...	...	...	...	...	1	0·01	...	...	...	...
Kharsu	I	...	...	...	...	13	0·10	321	2·33	35	0·24
	II	...	...	...	...	50	0·38	726	5·26	101	0·69
	III	...	...	...	...	162	1·20	2,865	20·76	448	3·07
	IV	...	...	...	...	998	7·45	5,615	40·69	806	5·52
Total ...	...	...	...	...	...	1,223	9·13	9,527	69·04	1,390	9·52
Ayár	I	2	0·01	40	0·18	2	0·01	...	...	17	0·12
	II	12	0·08	67	0·30	3	0·02	1	...	24	0·16
	III	72	0·46	257	1·17	55	0·41	5	0·04	135	0·92
	IV	297	1·92	1,166	5·30	288	2·13	90	0·65	310	2·12
Total ...	...	383	2·47	1,530	6·95	348	2·58	96	0·69	486	3·32
Brons	I	59	0·38	65	0·29	21	0·16	24	0·17	70	0·48
	II	87	0·56	106	0·48	69	0·51	31	0·22	105	0·72
	III	226	1·46	216	0·98	169	1·26	67	0·49	230	1·57
	IV	587	3·79	692	3·15	399	2·98	463	3·36	474	3·25
Total ...	...	959	6·19	1,079	4·90	658	4·91	585	4·24	879	6·02
GRAND TOTAL ...	...	43·82	28·06	6,042	27·46	3,666	27·34	10,231	74·14	4,325	29·60

Compartment 6, area 228 acres.		Compartment 7, area 93 acres.		Compartment 8, area 300 acres.		Compartment 9, area 177 acres.		Compartment 10, area 109 acres.		Compartment 11, area 202 acres.		Compartment 12, area 393 acres.	
Gross number of trees.	Number of trees per acre.	Gross number of trees.	Number of trees per acre.	Gross number of trees.	Number of trees per acre.	Gross number of trees.	Number of trees per acre.	Gross number of trees.	Number of trees per acre.	Gross number of trees.	Number of trees per acre.	Gross number of trees.	Number of trees per acre.
10	0·04	...	...	18	0·06	1	...	...	...	1	...	...	...
7	0·03	...	...	13	0·04	1	...	...	...	...	...	...	...
1	...	...	...	7	0·02	1	...	...	...	...	...	...	...
10	0·04	1	0·01	19	0·07	2	0·01	...	...	2	0·01	...	...
28	0·11	1	0·01	57	0·29	5	0·01	...	...	3	0·01	...	...
7	0·03	...	...	10	0·03	...	...	...	...	...	...	...	...
7	0·03	...	...	13	0·04	...	...	...	...	...	...	...	...
72	0·31	...	...	50	0·17	...	...	...	...	...	...	...	...
431	1·90	2	0·02	257	0·86	...	...	...	...	...	...	...	...
517	2·27	2	0·02	330	1·10	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...
1	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...
1	...	...	...	...	...	...	...	...	...	...	...	...	...
117	0·51	9	0·10	168	0·56	298	1·68	159	1·46	601	2·98	...	...
112	0·49	5	0·05	168	0·56	301	1·70	183	1·68	895	4·43	...	...
120	0·52	11	0·12	402	1·34	383	2·16	176	1·61	1,136	5·62	...	...
109	0·48	14	0·15	197	0·66	1,097	6 31	143	1·31	1,722	8·52	...	...
458	2·00	39	0·42	935	3·12	2,079	11·85	661	6·07	4,354	21·56	...	...
40	0.18	85	0·91	76	0·26	...	...	...	...	42	0·20	...	...
38	0·16	155	1·67	74	0·24	...	...	...	...	63	0·31	...	...
63	0·27	285	3·06	88	0·30	...	...	...	...	183	0·90	...	...
96	0.42	581	6·25	264	0·88	...	...	...	...	554	2·74	..	...
237	1·03	1,106	11·89	502	1·68	...	...	...	...	842	4·17	...	...
...	...	...	...	2	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	4	0·01	...	...	...	...	...	...	...	...
...	...	...	...	6	0·01	...	...	...	...	...	...	...	...
23	0·10	151	1·62	10	0·03	...	...	...	...	...	...	...	...
28	0·12	387	4·16	12	0·04	...	...	...	...	...	...	...	...
67	0·27	932	10·02	20	0·07	...	...	...	...	...	...	...	...
187	0·81	1,702	18·30	96	0·32	...	...	...	...	...	...	...	...
299	1·31	3,172	34·10	138	0·46	...	...	...	...	...	...	...	...
2	...	1	0·01	16	0·06	3	0·01	2	0·01	6	0·02	...	...
3	0·01	4	0·15	37	0·12	15	0·08	3	0·02	52	0·26	...	...
5	0·02	80	0·86	121	0·40	82	0·46	26	0·23	182	0·90	...	...
23	0·10	393	4·23	260	0·87	483	2·72	133	1·22	914	4·52	...	...
33	0·13	478	5·25	434	1·44	583	3·27	164	1·48	1,154	5·70	...	...
6	0·02	90	0·97	55	0·19	13	0·07	6	0·05	35	0·17	...	...
11	0·04	194	2·09	87	0·29	37	0·20	24	0·22	73	0·36	...	...
23	0·10	496	5·33	200	0·67	88	0·44	48	0·44	208	1·02	...	...
52	0·22	799	8·59	369	1·23	374	2·11	93	00·85	892	4·41	...	...
92	0·40	1,579	16·98	711	2·38	512	2·89	171	1·57	1,208	5·98	...	...
1,665	7·30	6,377	68·68	3,113	10·38	3,179	17·96	996	9·13	7,561	37·43	...	...

Species.	Diameter-class.	Compartment 13, area 207 acres. Gross number of trees.	Compartment 13, area 207 acres. Number of trees per acre.	Compartment 14, area 225 acres. Gross number of trees.	Compartment 14, area 225 acres. Number of trees per acre.	Compartment 15, area 180 acres. Gross number of trees.	Compartment 15, area 180 acres. Number of trees per acre.	Compartment 16, area 66 acres. Gross number of trees.	Compartment 16, area 66 acres. Number of trees per acre.	Compartment 17, area 96 acres. Gross number of trees.	Compartment 17, area 96 acres. Number of trees per acre.
Chír ...	I	...	...	...	...	68	0·38	...	...	32	0·33
	II	...	...	...	...	74	0·41	...	...	61	0·64
	III	...	...	...	...	80	0·44	...	...	49	0·51
	IV	...	...	1	...	118	0·66	...	...	64	0·67
Total ...	...	...	...	1	...	340	1·89	...	...	206	2·15
Cypress ...	I	...	...	...	...	...	...	...	...	...	...
	II	...	...	...	...	...	...	...	...	...	...
	III	...	...	...	...	...	...	...	...	...	...
	IV	...	...	...	...	...	...	...	...	...	...
Total ...	...	...	...	...	...	...	...	...	...	...	...
Phanyáth ...	I	...	...	...	...	...	...	...	...	...	...
	II	...	...	...	...	...	...	...	...	...	...
	III	...	...	...	...	...	...	...	...	...	...
	IV	...	...	...	...	...	...	...	...	...	...
Total ...	...	...	...	...	...	...	...	...	...	...	...
Bánj ...	I	267	1·30	211	0·93	243	1·35	...	...	455	4·74
	II	196	0·93	182	0·80	371	2·06	...	...	455	4·74
	III	274	1·32	264	1·18	1,281	7·11	...	...	522	5·44
	IV	523	2·52	1,755	7·80	5,523	30·69	...	...	835	8·70
Total ...	...	1,260	6·08	2,412	10·72	7,418	41·21	...	...	2,267	23·62
Tilonj ...	I	630	3·04	160	0·71	...	...	...	...	8	0·08
	II	550	2·66	175	0·78	...	...	...	...	4	0·04
	III	1,011	4·89	314	1·40	1	...	...	...	37	0·39
	IV	2,541	12·28	1,084	4·81	36	0·20	...	...	116	1·21
Total ...	...	4,732	22·87	1,733	7·70	37	0·20	...	...	165	1·72
Riánj ...	I	97	0·47	49	0·21	...	...	...	...	...	...
	II	68	0·32	40	0·18	...	...	...	...	...	...
	III	150	0·72	87	0·39	...	...	...	...	...	...
	IV	482	2·32	842	3·74	...	...	...	...	...	...
Total ...	...	797	3·85	1,018	4·52	...	...	...	...	...	...
Kharsu ...	I	404	1·95	77	0·34	...	...	...	...	...	...
	II	393	1·89	66	0·30	...	...	...	...	...	...
	III	826	4·00	185	0·82	...	...	...	...	...	...
	IV	1,481	7·15	607	2·70	...	...	...	...	...	...
Total ...	...	3,104	15·00	935	4·16	...	...	...	...	...	...
Ayár ...	I	26	0·12	28	0·12	2	0·01	...	...	7	0·07
	II	62	0·30	74	0·32	10	0·06	...	...	7	0·07
	III	280	1·35	524	2·32	47	0·26	...	...	45	0·47
	IV	1,152	5·57	2,176	9·68	181	1·00	...	...	276	2·87
Total ...	...	1,520	7·34	2,802	12·46	240	1·33	...	...	335	3·49
Brons ...	I	440	2·12	283	1·26	34	0·19	...	...	74	0·77
	II	644	3·11	496	2·20	68	0·38	...	...	119	1·24
	III	1,089	5·27	1,203	5·34	164	0·91	...	...	224	2·33
	IV	2,674	12·91	3,200	14·22	321	1·78	...	...	660	6·87
Total ...	...	4,847	23·41	5,182	23·03	587	3·26	...	...	1,077	11·22
GRAND TOTAL ...	...	16,260	78·55	14,083	62·59	8,622	47·90	..	...	4,050	42·19

Compartment 18, *area* 112 *acres.*		*Compartment* 19, *area* 81 *acres.*		*Compartment* 20, *area* 234 *acres.*		*Compartment* 21, *area* 158 *acres.*		*Compartment* 22, *area* 219 *acres.*		*Entire block, area* 3,864 *acres.*	
Gross number of trees.	Number of trees per acre.	Gross number of trees.	Number of trees per acre.	Gross number of trees.	Number of trees per acre.	Gross number of trees.	Number of trees per acre.	Gross number of trees.	Number of trees per acre.	Gross number of trees.	Number of trees per acre.
15	0·13	55	0·68	52	0·22	77	0·49	14	0·06	344	0·08
42	0·37	55	0·68	76	0·32	141	0·90	11	0·05	481	0·12
44	0·39	46	0·57	91	0·39	203	1·29	11	0·05	533	0·13
55	0·49	95	1·17	47	0·20	205	1·30	19	0·84	642	0·17
156	1·38	251	3·10	266	1·13	626	3·96	55	1·00	2,000	0·50
...	...	...	...	...	...	...	...	...	...	17	...
...	...	...	...	...	...	...	...	...	...	22	...
...	...	...	...	...	...	...	...	...	...	134	0·03
...	...	...	...	...	...	...	...	...	...	711	0·18
...	...	...	...	...	...	...	...	...	...	884	0·22
...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	1	...
...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	1	...
174	1·55	286	3·53	547	2·33	666	4·21	681	3·10	5,570	1·44
426	3·80	232	2·86	585	2·50	687	4·34	1,074	4·90	5,663	1·47
697	6·22	155	1·91	877	3·74	823	5·20	1,535	7·00	10,035	2·59
4,061	36·25	154	1·90	1,999	8·54	2,806	17·76	5,607	25·60	30,357	7·86
5,358	47·83	827	10·21	4,008	17·12	4,982	31·53	8,897	40·60	51,625	13·37
4	0·03	19	0·23	126	0·53	108	0·68	303	1·39	1,815	0·47
6	0·05	22	0·27	148	0·63	129	0·81	383	1·74	1,983	0·51
40	0·35	6	0·07	236	1·00	196	1·24	749	3·42	3,839	1·00
187	1·67	9	0·11	532	2·28	1,113	7·04	3,519	16·07	12,314	3·19
237	2·11	56	0·69	1,042	4·45	1,546	9·78	4,954	22·62	19,951	5·17
...	...	...	...	...	...	...	...	...	...	148	0·03
...	...	...	...	...	...	...	...	...	...	108	0·02
...	...	...	...	...	...	...	...	...	...	237	0·06
...	...	...	...	...	...	...	...	...	...	1,329	0·34
...	...	...	...	...	...	...	...	...	...	1,822	0·47
...	...	...	...	...	...	...	...	...	...	1,034	0·27
...	...	1	0·01	...	...	...	...	...	...	1,764	0·45
...	...	1	0·01	...	...	...	...	...	...	5,500	1·42
...	...	...	...	...	...	...	...	...	...	11,492	2·98
...	...	2	0·02	...	...	...	...	...	...	19,790	5·12 5·12
...	...	42	0·52	16	0·06	7	0·04	6	0·02	225	0·05
5	0·04	121	1·49	54	0·23	32	0·20	32	0·14	618	0·16
43	0·38	322	3·97	352	1·50	171	1·08	326	1·49	3,130	0·81
259	2·31	399	4·93	1,175	5·02	1,130	7·16	2,632	12·01	13,737	3·55
307	2·74	884	10·91	1,579	6·82	1,340	8·48	2,996	13·68	17,710	4·57
28	0·25	245	3·02	448	1·91	240	1·51	488	2·22	2,724	0·70
64	0·57	508	6·27	666	2·84	474	3·00	750	3·42	4,613	1·19
165	1·47	718	8·86	1,170	5·00	746	4·72	1,675	7·64	9,125	2·36
655	5·84	893	11·02	2,314	9·89	2,068	13·08	5,095	23·27	23,074	5·97
912	8·14	2,364	29·18	4,598	19·64	3,528	22·32	8,008	36·57	39,536	10·23
6,970	62·23	4,384	54·12	11,511	41·19	12,022	76·08	24,910	113·71	153,319	29·68

Grazing.—Heavy between and immediately north of Pangot and Bagarh; prohibited elsewhere.

Export lines.—The whole of the northern basin is well furnished with bridle-roads. In the other basin the only bridle-road is the China tourists' road and its continuation to Pangot. Numerous foot-paths, however, exist, suitable for export of light headloads of fuel and grass.

China 1.

Boundaries.—North, prominent spur separating compartment from China 2; east, continuation of Deopáta ridge, bounding it off from the Naini Tál municipality lands; south and west, a straight line following no natural feature and forming common boundary between Naini Tál protected forests and proposed reserved forest.

Area.—155 acres, of which 40 unproductive.

Configuration and aspect.—The ground is rugged and very irregular, but may be said generally to fall to the south-west. Deep ravines with steep and often scarped sides are numerous. The western half of the compartment is drained westward into the Káphaliagád, a feeder of the Luintagád; the eastern half southward into a larger feeder of the Digaulagád. The gradients seldom fall below 30°.

Elevation.—Maximum 7,776 feet, minimum 6,000 feet, mean 7,000 feet.

Soil and underlying rock.—As in China 2, but with the underlying rock more exposed owing to the steeper gradients.

Stock.—Much as in China 2, except that the density is more uniform, thanks to a moister and warmer south-west exposure, and may be represented by a mean co-efficient of 0·5. On the whole a promising fuel forest.

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chír ...	1	100	40	...	...	...	...	...	...	4	...	28
Oaks ...	207	...	18,630	284	...	11,360	794	...	11,910	1,720	...	6,880
Ayár and brons ...	61	...	2,135	99	...	1,782	298	...	1,788	884	...	1,326
Sál ...	...	...	...	...	...	...	...	...	...	...	...	...
Sain ...	...	...	...	...	...	...	...	...	...	...	...	...
Cypress ...	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	269	100	20,805	383	...	13,142	1,092	...	13,698	2,608	...	8,234

Reproduction.—Tilonj and bánj, each at their appropriate elevation, are making good progress as young coppice. Mean co-efficient 0·6.

Grazing.—Slight.

Export lines.—A good foot-path runs through the compartment and meets the Kiládhungi district bridle-road in the Saria Tál valley.

China 2.

Boundaries.—North, Luintagád separating compartment from China 5 and 6; east, a fairly well-marked spur separating it from China 3; south, prominent spur separating it from China 1; west, proposed reserved forest with no natural feature between.

Area.—220 acres, of which 55 unproductive.

Configuration and aspect.—This compartment occupies a portion of the northerly slopes which run down from the Deopáta ridge to the Luintagád. At its

north-west extremity in the vicinity of the gád, and in its upper half the gradients generally exceed 40° and scarps are numerous. Elsewhere the slopes vary from 20° to 35°. The sots which drain the compartment divide it off into broad rounded spurs. Nearly the whole compartment is exposed to the full brunt of the northerly winds.

Elevation.—Maximum 7,776 feet, minimum 5,000 feet, mean 6,300 feet.

Soil and underlying rock.—A sandy soil, generally shallow, containing a large proportion of lime, due to the underlying krol limestone which crops out everywhere in crag-like masses at the top of the compartment. In the lower portion of the compartment the underlying rock is shale. Soil rich, covering itself with a strong growth of grass, excellent for bánj and tilonj.

Stock.—The top of the compartment is sprinkled (mean density 0·3) with tilonj and brons. The density improves as we descend, increasing to 0·6, and tilonj is replaced by bánj in two-thirds of the compartment. The trees are generally crooked, short-boled and branchy, the result of exposure to north winds, but especially of constant severe lopping and felling until six years ago. Shrubby undergrowth, including ringál, is abundant.

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chír ...	...	...	...	...	...	...	...	...	...	...	...	...
Oaks ...	506	...	45,540	531	...	21,240	694	...	10,410	1,702	...	6,808
Ayár and brons ...	105	...	3,675	173	...	3,114	473	...	2,838	1,858	...	2,787
Sál ...	...	...	...	...	...	...	...	...	...	...	...	...
Sain ...	...	...	...	...	...	...	...	...	...	...	...	...
Cypress ...	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	611	...	49,215	704	...	24,354	1,167	...	13,248	3,560	...	9,595

Reproduction.—Young oak, rhododendron, and ayár coppice is coming up well and in abundance, but new seedlings are not numerous. Mean co-efficient 0·5.

Grazing.—Nil.

Export lines.—Mere steep foot-paths, in constant use by Jhámpánis from the station, intersect the compartment.

China 3.

Boundaries.—North, partly a prominent spur separating compartment from China 5, partly Deopáta-Pangot bridle-road separating it from China 4 ; east and south, Deopátá ridge separating it from Naini Tál station ; west, ill-defined spur separating it from China 2.

Area.—134 acres, of which 40 unproductive.

Configuration and aspect.—This compartment is situated just below the Deopáta-Pangot bridle-road on slopes which come down partly from the China, partly from the Deopáta ridge, and which compose the deep rugged bay formed by the right bank of the Luintagád and its feeders. The gradients vary between very wide limits, but seldom fall below 20°, and more generally attain 30°. The sides enclosing the bay are scarped at nearly every point. The Deopáta slopes, about two-thirds of the compartment, look north-west, while the China slopes look partly west and partly south.

Elevation.—Maximum 8,000 feet, minimum 6,200 feet, mean about 7,300 feet.

Soil and underlying rock.—Loam of variable depth, free, generally rich and moist,

resting on limestone near the ridge, on shales elsewhere ; excellent for the various oaks according to elevation.

Stock.—Heavy fellings having been made, before conservation began, to supply the station with fuel, the present stock is quite young. The density is 1·0 in many places, but if small blanks here and there be excluded, it is generally 0·7. Oaks, tilonj especially, are the most abundant species. The quantity of brushwood is large.

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chír ...	...	...	...	...	...	...	...	...	...	...	...	...
Oaks ...	70	...	6,300	115	...	4,600	364	...	5,460	2,111	...	8,444
Ayár and brons ...	23	...	805	72	...	1,296	224	...	1,344	687	...	1,030
Sál ...	...	...	...	...	...	...	...	...	...	...	...	...
Sain ...	...	...	...	...	...	...	...	..	...	...	...	...
Cypress ...	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	93	...	7,105	187	...	5,896	588	...	6,804	2,798	...	9,474

Reproduction.—Strong advance growth of oaks, chiefly tilonj and kharsu, is abundant and is in most places sufficient to complete the stock. Plantations of deodár, walnut, oak, horse-chestnut, bánj, and tilonj have been made through the upper part of the compartment. The success of deodár and horse-chestnut is doubtful, but tilonj has given magnificent results, saplings 7 years old being already from 7 to 15 feet high and remarkable vigorous.

Grazing.—Nil.

Export lines.—The Deopáta-Pangot bridle-road forms part of the northern boundary of compartment, and numerous foot-paths, much used by Jhámpanis, traverse the whole area.

China 4.

Boundaries.—North and east, the great China ridge separating compartment from Jákh 3, China 12, and Naini Tál station ; south, Deopáta-Pangot bridle-road ; west, prominent spur separating compartment from China 7.

Area.—138 acres, of which 30 unproductive.

Configuration and aspect.—This compartment occupies the entire westerly slopes of the great China ridge above the Deopáta-Pangot bridle-road from the forest chauki to the eastern boundary of China 7. The ground is cut up by shallow water-courses which give the slopes rounded contours. The gradients are steepest in the southern half of the compartment (30° to 40°), the aspect there being westerly. In the other half, which looks south-west, the gradients are generally easier, varying from 20° to 30°.

Elevation.—Maximum 8,626 feet, minimum 7,513 feet, mean about 8,000 feet.

Soil and underlying rock.—A rich loam, very free, moist, nearly always deep, overlying loose shale chiefly and sandstone. The hill is breaking along the edge which overhangs the station. Excellent soil for kharsu.

Stock.—An almost complete crop of kharsu of straight and vigorous growth, with some brons, ayár, and tilonj. A few places where the crop opens out a little, there is a very dense undergrowth of barberry, *Desmodium tiliæfolium*, *Indigofera*, *Viburnum Daphne*, &c.

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chír ...	...	...	...	...	...	...	...	...	...	...	...	...
Oaks ...	324	...	29,160	727	...	29,080	2,866	...	42,990	5,631	...	22,524
Ayár and brons ...	24	...	840	32	...	576	72	...	432	553	...	829
Sál ...	...	...	...	...	...	...	...	...	...	...	...	...
Sain ...	...	...	...	...	...	...	...	...	...	...	...	...
Cypress ...	...	...	...	1	70	30	...	...	...	1	...	10
Total ...	348	...	30,000	760	70	29,686	2,938	...	43,422	6,185	...	23,363

Reproduction.—Almost *nil* under the dense upper crop. A lot of deodár has been planted under the oaks, some of which have been cut away to admit light. The success of the plantation is doubtful, although some of the seedlings, now from four to thirteen years old, are looking well. As a rule the place is too damp for deodár.

Grazing.—Nil.

Export lines.—The Deopáta-Pangot bridle-road flanks the southern boundary and the China pic-nic branch zigzags through the compartment to the highest point near which it meets the bridle-road from Fairlight Hall.

China 5.

Boundaries.—North and west, partly Deopáta-Pangot bridle-road separating compartment from China 4, partly a sot separating it from China 6 ; east and south, partly Deopáta-Pangot bridle-road separating it from China 4, partly a well-marked spur separating it from China 2 and 3.

Area.—146 of which 30 unproductive.

Configuration and aspect.—This compartment occupies for the most part both sides of a long spur running south-west from the point where the Deopáta-Pangot bridle-road bifurcates down to the Luintagád. The remaining portion (the south-east extremity) consists of the western face of a shorter parallel spur. The compartment is thus traversed along the whole of its length by one of the feeders of the Luintagád, and the main fall of the ground is towards the south-west. All the slopes are effectively sheltered both on the north and east by the China and Deopáta ridges respectively. The gradients are very steep, varying from 25° to 40° with some scarps.

Elevation.—Maximum 8,000 feet, minimum 6,000 feet, mean about 6,800 feet.

Soil and underlying rock.—As in China 6.

Stock.—The western face of the main spur is blank, but has been recently planted up with deodár, walnut, and horse-chestnut. The rest of the compartment is stocked with mixed oaks, brons, and ayár ; the density varying from 0·2 to 0·7, the average being about 0·4.

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chír	...	...	...	...	...	...	...	...	...	...	...	...
Oaks ...	164	...	14,760	247	...	9,880	766	...	11,490	1,750	...	7,000
Ayár and brons ...	87	...	3,045	129	...	2,322	365	...	2,190	784	...	1,176
Sál	...	...	..	...	...	..	...	...	...	...	...	...
Sain ...	...	...	...	...	...	...	...	...	...	...	...	...
Cypress ...	...	...	...	1	70	30	12	300	120	20	...	200
Total ...	251	...	17,805	377	70	12,232	1,143	300	13,800	2,554	...	8,376

Reproduction.—The plantation on the western face of the main spur has already been described. Elsewhere the advance growth, consisting chiefly of oaks, may be represented by an average co-efficient of 0·2.

Grazing.—Nil.

Export lines.—The Deopáta-Pangot bridle-road runs along a portion of the eastern boundary of the compartment and several steep foot-paths traverse it in various directions.

China 6.

Boundaries.—North and west, partly the Deopáta-Naini Tál bridle-road separating compartment from China 4, and partly a well-marked long spur separating it from China 7 and 8 ; east and south, partly a sot separating it from China 5, partly the Luintagád separating it from China 2.

Area.—221 acres, of which 30 unproductive.

Configuration and aspect.—Chiefly south-easterly slopes protected on the north-west by the crest of the spur forming the northern boundary of the compartment. The gradients seldom fall below 30°.

Elevation.—Maximum 8,000 feet, minimum 5,000 feet, mean 7,000 feet.

Soil and underlying rock.—A rich, free, fairly deep loam, where it has not slipped or been washed away owing to the absence of forest growth. Underlying rock chiefly loose shale with krol limestone at the higher points. Excellent soil for kharsu, tilonj, and bánj according to elevation.

Stock.—The compartment is generally bare, with the exception of the vicinity of the sot and gád, where fairly well-grown oaks, chiefly bánj and tilonj, are found, forming with ayár and brons a density of about 0·4, and cypress occurs scattered along the middle of the slopes.

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chír	10	1,000	400	7	420	175	1	20	12	10	...	70
Oaks ...	180	...	16,200	178	...	7,120	245	...	3,675	392	...	1,568
Ayár and brons ...	8	...	280	14	...	252	28	...	168	75	...	112
Sál	...	...	...	...	...	...	...	...	...	...	...	...
Sain	...	...	...	...	...	...	...	...	...	...	...	...
Cypress ...	7	840	280	7	490	210	72	1,800	720	431	...	4,310
Total ...	205	1,840	17,160	206	910	7,757	346	1,820	4,575	908	...	6,060

Reproduction.—Almost *nil.*

Grazing.—Nil.

Export lines.—The Deopáta-Pangot bridle-road forms the northern boundary of compartment and several foot-paths traverse it from top to bottom.

China 7.

Boundaries.—North, the great China ridge separating compartment from China 12; east and south, upper portion of a long prominent spur separating it from China 4, 6, and 8; west, partly a well-defined spur, partly a foot-path separating it from China 8.

Area.—93 acres, of which 15 unproductive.

Configuration and aspect.—This compartment occupies the upper bay-like portion of the basin of one of the tributaries of the Luintagád. The general fall of the ground is south-westerly, but, owing to deviating contours, the western half of the compartment is turned south and the other west. The gradients generally exceed 25° and sometimes run into scarps, but the slopes above the Deopáta-Pangot bridle-road are fairly uniform.

Elevation.—Maximum 8,200 feet, minimum 7,000 feet, mean 7,800 feet.

Soil and underlying rock.—A deep, free, moist, rich loam, overlying, at the top of the compartment, black krol limestone, elsewhere loose, crumbling shale; excellent for kharsu and tilonj.

Stock.—The upper half of the compartment is all but completely stocked with kharsu and tilonj of excellent growth. Elsewhere the density diminishes till it reaches 0·3 at the western extremity of the compartment; but the species remain the same, except that a few bánj come in and the proportion of brons and ayár increases. Chír just reaches the lowest point of the compartment, and cypress merely puts in an appearance immediately below the bridle-road.

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chír ...	...	...	...	...	...	...	...	...	...	1	...	7
Oaks ...	245	...	22,050	547	...	21,880	1,228	...	18,420	2,297	...	9,188
Ayár and brons ...	91	...	3,185	198	...	3,564	576	...	3,456	1,192	...	1,788
Sál ...	...	...	...	...	...	...	...	...	...	...	...	...
Sain ...	...	...	...	...	...	...	...	...	...	...	...	...
Cypress ...	...	...	...	...	...	...	...	...	...	2	...	20
Total ...	336	...	25,235	745	...	25,444	1,804	...	21,876	3,492	...	11,003

Reproduction.—The stock is generally too dense for advance growth, but on the bare spur at the western extremity of the compartment small tilonj and brons are present to the extent of 0·4.

Grazing.—Nil.

Export lines.—The Deopáta-Pangot bridle-road runs through the middle of the compartment and there are one or two foot-paths that come down from the ride.

China 8.

Boundaries.—North, long prominent spur separating compartment from China 9 and 11; east, partly a short spur, partly a foot-path separating it from China 7; south, long prominent spur separating it from China 6; west, a straight line not marked on the ground, separating it from the proposed reserved forest.

Area.—304 acres, of which 50 unproductive.

Configuration and aspect.—This compartment occupies the lower portion of the bay, the upper portion of which forms China 7. The ground falls away to the west, but, owing to a succession of small spurs, minor southerly and easterly aspects occur. The gradients generally exceed 30°, and many of the slopes are precipitous.

Elevation.—Maximum 7,784 feet, minimum 4,500 feet, mean 6,000 feet.

Soil and underlying rock.—A fairly rich loam, generally deep, overlying, at the top of the compartment, the black krol limestone, elsewhere loosely bedded crumbling shales, both rocks cropping out at a few points; excellent for oaks.

Stock.—With the exception of the sots, which are rather densely wooded (0·8), especially in the lower portion of the compartment, with oaks, ayár, brons and soft woods, the slopes are very bare, being simply dotted with trees, of which cypress is the most conspicuous. Chír is almost entirely absent.

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chír ...	18	1,800	720	13	780	325	7	140	84	19	...	133
Oaks ...	256	...	22,940	254	...	10,160	510	...	7,650	561	...	2,244
Ayár and brons ...	71	...	2,485	124	...	2,232	321	...	1,926	629	.	943
Sál ...	...	...	...	...	...	...	...	...	...	...	...	...
Sain ...	...	...	...	...	...	...	...	...	...	...	...	...
Cypress ...	10	1,200	400	13	910	390	50	1,250	500	257	...	2,570
Total ...	355	3,000	26,545	404	1,690	13,107	888	1,390	10,160	1,466	...	5,890

Reproduction.—In the sots the reproduction may be represented by a co-efficient of 0·2; elsewhere it is practically 0·0.

Grazing.—Nil.

Export lines.—Three several foot-paths traverse the compartment from south-west to north-east.

China 9.

Boundaries.—North, a fairly well-marked spur separating compartment from China 10 and 11; east, prominent spur separating it from China 8; south, continuation of the same spur separating it, also from China 8; west, partly a straight line not marked on the ground, being the boundary between the protected and proposed reserved forests, partly the Bara Tota raula separating compartment from the Commissioner's forests outside.

Area.—180 acres, of which 35 unproductive.

Configuration and aspect.—The western third of this compartment falls away directly in a westerly direction to the Bara Tota raula, the gradients being easy at first, then becoming precipitous. The rest of the compartment consists of a deep, narrow, rugged bay formed by a small much-branched stream which runs westward into the same raula. The slopes on the left of the stream look north, and are easy at first (gradients from 15° to 30°); but become precipitous near the stream. All the remaining slopes are more or less scarped.

Elevation.—Maximum 6,875 feet, minimum 3,500 feet, mean 5,000 feet.

Soil and underlying rock.—A sandy clay, fairly deep, overlying shales; excellent for bánj.

Stock.—Rathermore than three-fourths of the compartment, consisting of westerly slopes, are dotted with scattered trees and clumps of trees. The rest of the area is pretty thickly stocked with bánj forest mixed with ayár and brons. The trees are generally stunted and wanting in vigour.

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chír ...	1	100	40	1	60	25	1	20	12	2	...	4
Oaks ...	298	...	26,820	301	...	12,040	383	...	5,745	1,097	...	4,388
Ayár and brons ..	16	...	560	52	...	936	170	...	1,020	857	...	1,285
Sál ...	...	...	..	...	...	...	...	...	...	...	...	...
Sain ...	...	...	..	...	...	...	...	...	...	...	...	...
Cypress ...	...	...	...	...	...	...	...	...	...	..	...	...
Total ...	315	100	27,420	354	60	13,001	554	20	6,777	1,956	..	5,687

Reproduction.—Almost *nil* in the open part, elsewhere about 0·2.

Grazing.—Nil.

Export lines.—Two foot-paths traverse the compartment from south to north, but at present this compartment is accessible with difficulty from Naini Tál station.

China 10.

Boundaries.—North and east, prominent spur separating compartment from China 11 ; south, prominent spur separating compartment from China 9 ; west, the Bara Tota raula forming external boundary of the forest.

Area.—111 acres, of which 30 unproductive.

Configuration and aspect.—With the exception of the northern corner, a triangular area of about 30 acres, and of about 10 acres at the western corner, both of which directly overhang the Bara Tota raula, the compartment consists of the funnel-shaped bay formed by a short much-branched stream which runs westward into that raula. The slopes are nearly everywhere precipitous and have a westerly aspect.

Elevation.—Maximum 6,700 feet, minimum 4,000 feet, mean 4,700 feet.

Soil and underlying rock.—As in China 9.

Stock.—The trees, bánj chiefly with ayar and brons, are generally more or less scattered (density about 0·2) and are stunted and seedy-looking.

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chír ...	...	...	...	...	...	...	...	...	...	...	...	...
Oaks ...	159	...	14,310	183	...	7,320	176	...	2,640	143	...	572
Ayár and brons ...	8	...	280	27	...	486	74	...	444	226	...	339
Sál	...	...	.	..	...	...	..	...	...	...	...	...
Sain ...	...	...	...	...	...	...	...	...	...	...	...	...
Cypress ...	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	167	...	14,590	210	...	7,806	250	...	3,084	369	...	911

Reproduction.—Advance growth in the shape chiefly of bushes of bánj, brons, and ayár, exists to the extent of about 0·2.

Grazing.—Nil.

Export lines.—A foot-path going up to the Deopáta-Pangot bridle-road traverses the compartment from south to north, but access under any circumstances is difficult.

China 11.

Boundaries.—North, partly the Pangot sot dividing compartment from China 16, partly a well-marked spur separating it from China 12 ; east, upper portion of the same spur separating it from China 12 ; south, prominent ridge and continuation of the great China ridge, separating it from China 8 ; west, well-defined spur separating it from China 9 and 10.

Area.—205 acres, of which 35 unproductive.

Configuration and aspect.—This compartment occupies the northerly and north-westerly slopes which compose the broad, deep, rugged bay formed by the head-waters of a much-branched tributary of the Pangot sot. The ground falls more than 3,000 feet in less than 6,700 feet. The gradients are very steep, ranging generally between 35° and 40°.

Elevation.—Maximum 7,784 feet, minimum 4,600 feet, mean 6,000 feet.

Soil and underlying rock.—As in China 8.

Stock.—The nearly westerly slopes forming the northern portion of the bay are generally very bare (density 0·2) ; elsewhere the average density is 0·6. The stock consists chiefly of bánj with ayár and brons, and also tilonj at the higher elevations, where this latter species becomes, however, the sole oak. The Bhadli plantations of ash and bánj are situated in this compartment and were started in 1881. The growth of the present stock is not vigorous.

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chír ...	1	100	40	...	...	...	...	...	...	2	...	14
Oaks ...	643	...	57,870	958	...	38,320	1,319	...	19,785	2,276	...	9,104
Ayár and brons ...	41	...	1,435	125	...	2,250	390	...	2,340	1,806	...	2,709
Sál ...	...	...	...	...	...	...	...	...	...	...	...	...
Sain ...	...	...	...	...	...	...	...	...	...	...	...	...
Cypress ...	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	685	100	59,345	1,083	...	40,570	1,709	...	22,125	4,084	...	11,827

Reproduction.—In the northern portion of the bay there is scarcely any advance growth ; elsewhere it is represented by a co-efficient of about 0·5. The species everywhere are the same as those in the upper crop.

Grazing.—Nil.

Export lines.—Several foot-paths, with steep gradients, traverse the compartment and connect it with the Deopáta-Pangot forest bridle-road.

China 12.

Boundaries.—North, partly watercourses, partly spurs, separating compartment from China 13, 14, 15, and 16 ; east, a prominent spur eparating it from Jákh 3 ; south and west, the great China ridge separating it from China 4, 7, 8, and 11.

Area.—402 acres, of which 100 unproductive.

Configuration and aspect.—This long irregular shaped compartment occupies almost the entire northern face of the great China ridge. The slopes are extremely rugged and the gradients nearly everywhere exceed 35°, scarps being very Common.

Elevation.—Maximum 8,626 feet, minimum 4,701 feet, mean 7,500 feet.

Soil and underlying rock.—A very free sandy loam, generally rich, resting on krol limestone along the ridge, elsewhere on shales or loosely bedded friable sandstones, which are exposed on all steep faces and cover the ground with their débris.

Stock.—The forest consists chiefly of oaks, pure or mixed with brons and ayár, the chief oaks being kharsu, tilonj, and bánj, which vary with the altitude. The trees are generally vigorous, and, excepting several blanks, which are large in the western half of the compartment, where the ground is very steep, the co-efficient of density ranges from 0·3 to 0·7.

Summary of valuation.—No enumeration survey has been made, the ground being too steep to justify regular working.

Reproduction.—Where there is forest already, there advance growth of the oaks and of brons is generally abundant.

Grazing.—Nil.

Export lines.—The Deopáta-Pangot bridle-road traverses the middle of the compartment and a branch of this road goes off to Mauláni.

China 13.

Boundaries.—North, short spur separating compartment from Jákh 11; east, ridge separating it from Jákh 3, 4, 7, 9, and 10; south, China 12; west, ridge separating compartment from China 12 and 14.

Area.—208 acres, of which 35 unproductive.

Configuration and aspect.—This compartment occupies the central portion of the basin of the Mauláni gadhera, which, starting from under the highest China peak, flows almost due north into the Tikri nadi opposite Dária. The left side of this basin consists of very steep slopes (30° to 50°). The slopes on the right bank of the gadhera are much more gentle, the gradients seldom reaching 35° throughout the whole length of the compartment. The gadhera in its course of more than one mile falls only about 500 feet. The larger portion (about two-thirds) of the compartment, *viz.*, the right side of the basin, looks west; the slopes on the left side have generally an easterly aspect.

Elevation.—Maximum 8,050 feet, minimum 7,100 feet, mean about 7,600 feet.

Soil and underlying rock.—A sandy loam; on the westerly slopes deep, and containing a large quantity of humus where the forest has not been destroyed; on the easterly slopes of fair depth, full of fragments of the underlying shales and shaly schists. Soil excellent for kharsu, tilonj, and rhododendron forest.

Stock.—The upper third of the compartment on both sides of the gadhera consists almost purely of kharsu. Then follows mixed forest in which tilonj predominates and bánj begins to show itself. Below this comes rhododendron forest, containing an admixture of ayár and bánj, and on the right bank of the gadhera also a considerable proportion of riánj. The ground is well covered (density 0 7 to 1·0), except on the right side of the valley (the lower half of the compartment), which has once been under cultivation and is now filling up with brons, riánj, bánj, and ayár coppice interspersed with dense patches of *Indigofera* and thorny shrubs. The vegetation of the trees is everywhere excellent.

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chír ...	...	...	...	...	...	...	...	...	...	...	...	...
Oaks ...	1,398	...	125,820	1,207	...	48,280	2,261	...	33,915	5,027	...	20,108
Ayár and brons ...	466	...	16,310	706	...	12,708	1,369	...	8,214	3,826	...	5,739
Sál ...	...	...	...	...	...	...	...	...	...	...	...	...
Sain ...	...	...	...	...	...	...	...	...	...	...	...	...
Cypress ...	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	1,864	...	142,130	1,913	...	60,988	3,630	...	42,129	8,853	...	25,847

Reproduction.—Young seedlings of tilonj, kharsu, and riánj are abundant where seed-bearers of these species are found. Seedlings of bánj, brons, and ayár seem to produce themselves with much greater difficulty. Uncounted poles and low coppice of all the above species are plentifully scattered everywhere.

Grazing.—Nil.

Export lines.—The Naini Tál-Mauláni forest bridle-path traverses the compartment parallel to its eastern boundary and the forest bridle-path which connects that path with the Pangot-Gali-ká-khet forest bridle-road branches off from the former inside the compartment and runs through its middle for more than half a mile.

China 14.

Boundaries.—North, spur separating compartment from Jákh 12; east, prominent ridge separating it from China 13; south, China 12; west, the Pangot-Gali-ká-khet forest bridle-road and village lands of Pangot.

Area.—228 acres, of which 35 unproductive.

Configuration and aspect.—This compartment occupies, besides the precipitous easterly slopes running down from Pangot into the Tikri nadi (about one-sixth of the compartment), the westerly slopes which descend, at first more or less gently (20° to 30°), then rapidly (30° to 45°), to the same river. These latter slopes are rendered very rugged by numerous parallel ravines and gullies running down to the Tikri.

Elevation.—Maximum 8,000 feet, minimum 6,200 feet, mean about 7,000 feet.

Soil and underlying rock.—A sandy loam, generally deep, rich and moist, resting on soft shales and shaly friable sandstone, fragments of which are everywhere mixed with the soil in large proportion; excellent for oak and rhododendron forest.

Stock.—The gentle westerly slopes were formerly under cultivation (deserted village of Mauláni) and are even now grazed over, on which account the stock thereon consists of oak, rhododendron, and ayár scrub, interrupted by numerous blanks, now being sown with oaks, ash, and walnut. Bánj is the prevailing oak, riánj is not uncommon above 6,800 feet, and tilonj occurs scattered everywhere. All the trees bear marks of severe lopping in former times. In the remainder of the compartment the ground is well covered (density 0·6 to 0·8), chiefly with brons, oak, and ayár forest, kharsu being conspicuous above 7,000 feet, tilonj on easterly slopes, and bánj everywhere else. Where the trees have had any chance they are of very large size.

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chír... ...	...	...	...	...	...	...	...	...	...	1	...	7
Oaks... ...	497	...	44,730	463	...	18,520	850	...	12,750	4,288	...	17,152
Ayár and brons ...	311	...	10,885	570	...	10,260	1,727	...	10,362	5,376	...	8,064
Sál	...	...	...	...	...	...	...	...	...	...	...	...
Sain ...	...	...	...	...	...	...	...	...	...	...	...	...
Cypress ...	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	808	...	55,615	1,033	...	28,780	2,577	...	23,112	9,665	...	25,223

Reproduction.—New reproduction by seed is rather backward, but uncounted poles and young coppice of banj, tilonj, rianj, brons, and ayár are plentiful on the sites abandoned by cultivation. Tilonj seems, better than any other species, to reproduce itself by seed in spite of unfavorable circumstances.

Grazing.—Heavy up to 1880 ; now stopped.

Export lines.—The Gali-ka-khet-Pangot forest bridle-road forms the western boundary of the compartment. The following forest bridle-paths intersect it in various directions :—(1) from Mauláni to Naini Tál ; (2) Mauláni to Pangot ; (3) from Mauláni to the Gali-ka-khet-Pangot bridle-road : (4) Chord path connecting (1) and (3).

Chína 15.

Boundaries.—North, detached fields of Bagarh and Dechauri-Rámgád bridle-road separating compartment from Chína 18; east, village lands of Pangot and Pangot-Gali-ka-khet bridle-path separating compartment from Chína 14 ; south, Pangot sot separating it from Chína 12; west, village lands of Bagarh.

Area.—180 acres, of which 35 unproductive.

Configuration and aspect.—This compartment occupies the southerly slopes which run down from the Deuchari-Rámgád bridle-road to the Pangot sot. With the exception of the abandoned fields of Gatgarh, which consist of a succession of natural terraces, the ground is extremely rugged and steep, most of the slopes being almos precipitous and cut up by deep ravines.

Elevation.—Maximum 6,500 feet, minimum 5,000 feet, mean about 5,700 feet.

Soil and underlying rock.—A sandy loam, deep on sites of old cultivation and in ravines (about one-third of the compartment), elsewhere shallow and sometimes absent, esting on shales and freely fissured friable sandstone; excellent for banj.

Stock.—The old cultivation sites are generally densely covered (density 0·8 to 1·0) with banj coppice. The steep slopes forming the rest of the compartment are fairly well stocked with banj forest, containing a sprinkling of brons and ayar. Tilonj puts in an appearance near the eastern boundary of the compartment and tall chír along the western boundary. The banj is suffering from the effects of former severe lopping, but some fine specimens are still to be found.

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chír ...	68	6,800	2,720	74	4,440	1,850	80	1,600	960	118	...	826
Oaks ...	243	...	21,870	371	...	14,840	1,282	...	19,230	5,559	...	22,236
Ayár and brons ...	36	...	1,260	78	...	1,404	211	...	1,266	502	...	753
Sál	...	...	...	...	...	...	...	...	...	...	...	...
Sain ..	...	...	...	...	...	...	...	...	...	...	...	...
Cypress ...	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	347	6,800	25,850	523	4,440	18,094	1,573	1,600	2,1,456	6,179	...	23,815

Reproduction.—As already said, the sites of former cultivation have filled up with a dense coppice of banj; elsewhere the reprodution is very backward (co-efficient 0·2).

Grazing.—Very heavy.

Export lines.—The Dechauri-Ramgad district bridle-road and Pangot-Deopáta forest bridle-path run along respectively the northern and eastern boundaries of the compartment.

China 16.

Area.—67 acres, of which 30 unproductive.

This very irregular and straggling compartment comprises the almost blank slopes and scarps jammed in between the Pangot sot, the village lands of Bágarh (four small detached chaks of which also honey-comb it), the sot forming the outer boundary of the forest and the Dechauri-Rámgád bridle road. There seems no reason for retaining this area, except perhaps to secure a symmetrical natural outer boundary for the Naini Tál protected forests.

China 17.

Boundaries.—North, ridge separating compartment from China 20 and outer boundary of the forest; east, spurs separating compartment from China 18 and 20; south, Dechauri-Rámgád bridle-road; west, outer forest boundary.

Area.—96 acres, of which 30 unproductive.

Configuration and aspect.—This compartment occupies the left-hand portion of the funnel-shaped basin of the upper half of the Bara Tota raula. The ground is rugged and extremely steep, half the slopes being precipitious, while many consist of sheer vertical drops. About one-fourth of the compartment at its northern end has a southerly aspect, and indeed the general fall of the ground is southwards, but the remaining slopes look also west.

Elevation.—Maximum 7,680 feet, minimum 5,450 feet, mean about 6,600 feet.

Soil and underlying rock.—A sandy loam, deep only in the ravines, elsewhere shallow and often absent, exposing the underlying shales and sand-stone; excellent for mixed banj and chír but for the precipitous character of the ground.

Stock.—There is a belt of tall chír trees along the southern boundary and the spur which forms the eastern boundary of the compartment, while the hollow extending from the Dechauai-Rámgád bridle-road to a little beyond the middle of the compartment is fairly well covered (density 0·5 to 0·8), with banj and brons forest, which also contains a sprinkling of ayár, the proportion of banj to other species being very nearly as 2 to 1. The bánj, although suffering from the effects of former severe lopping, is generally of vigorous growth and is represented by some trees of good dimensions. The rest of the compartment is very bare (density 0·1 to 0·4), the stock there consisting chiefly of bánj, brons, and tilonj.

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees	Cubic feet of timber.	Maunds of fuel.
Chir ...	32	3,200	1,280	61	3,660	1,525	49	980	588	64	...	448
Oaks ...	463	...	41,670	459	...	18,360	559	...	8,385	951	...	3,804
Ayár and brons ...	81	...	2,835	126	...	2,268	269	...	1,614	936	...	1,404
Sál ...	...	...	...	...	...	...	...	...	...	...	...	...
Sain ...	...	..	...	...	...	...	...	...	...	...	...	...
Cypress ...	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	576	3,200	45,785	646	3,660	22,153	877	980	10,587	1,951	...	5,656

Reproduction.—If scrubby uncounted poles and low coppice of bánj, brons, ayár, and tilonj kept down by cattle be excepted, the reproduction must be pronounced to be extremely backward. Chír seedlings are conspicuous by their almost total absence.

Grazing.—Very heavy in the accessible portion (about half the compartment).

Export lines.—The Dechauri-Rámgád district bridle-road bounds the compartment on the south.

China 18.

Boundaries.—North, ridge separating compartment from China 19 and 20; east, village lands of Pangot and spur separating compartment from China 19; south, Dechauri-Rámgád bridle-road and detached fields of Bagarh separating it from China 15; west, stream separating it from China 17.

Area.—112 acres, of which 20 unproductive.

Configuration and aspect.—This compartment occupies the south-westerly slopes immediately above the Dechauri-Rámgád bridle-road and the village of Pangot. The gradients are never less than 20°, but are generally above 28° and reach 45° near the bridge. The contours are more or less regular. A rapid stream has cut a deep ravine through its middle and a few gullies furrow the hill side.

Elevation.—Maximum 7,000 feet, minimum 6,000 feet, mean about 6,600 feet.

Soil and underlying rock.—A very sandy loam, seldom deep, resting on shales and freely-fissured quartzitic sandstone, fragments of which are everywhere mixed with and strewing the soil; excellent for bánj.

Stock.—With the exception of a good belt of tall rigorous chír growing along the western boundary of the compartment, the stock consists mainly of bánj sprinkled with brons and ayár, and mixed with tilonj in the vicinity of Pangot. The trees are low and branchy, owing to severe lopping in former times, and either grow in small clumps or singly and wide apart. The average density may be put down at 0·5.

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees,	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chír ...	15	1,500	600	42	2,520	1,050	44	880	528	55	...	385
Oaks ...	178	...	16,020	432	...	17,280	737	...	11,055	4,248	...	16,992
Ayar and borns ...	28	...	980	69	...	1,242	208	...	1,248	914	...	1,371
Sal ...	...	...	...	...	...	...	...	...	...	...	...	...
Sain ...	...	...	...	...	...	...	...	...	...	...	...	...
Cypress ...	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	221	1,500	17,660	543	2,520	19,572	989	880	12,831	5,217	...	18,748

Reproduction.—Extremely backward. A few young coppice clumps of bánj, brons, ayár, and tilonj are found scattered everywhere, but new seedlings are rare. Average co-efficient 0·1.

Grazing.—Heavy, owing to the grassy nature of the slopes.

Export lines.—The Dechauri-Rámgád district bridle-road, as said above, forms the southern boundary of the compartment.

China 19.

Boundaries.—East, the Binaik raula and Pangot-Jákh bridle-road separating compartment from Budhláket 1, Jákh 12, and China 14; west, China 18 and 20, and village lands of Pangot.

Area.—81 acres, of which 20 unproductive.

Configuration and aspect.—This compartment is situated on three sides (western, northern, and eastern) of a mammillary hill which rises abruptly (average gradient 35°) from the level of the Pangot-Jákh bridle-road. Some of the slopes are precipitous and are cut up by deep ravines.

Elevation.—Maximum 6,880 feet, minimum 5,700 feet, mean about 6,250 feet.

Soil and underlying rock.—A sandy soil; shallow and very stony on spurs and steep slopes and on eastern aspects generally; elsewhere for the most part deep and rich, resting on loosely-bedded, easily-disintegrating sandstone; excellent for bánj and brons.

Stock.—The easterly and northerly aspects are extremely bare, the result of former cultivation, the density varying from 0·0 to 0·3. The westerly slope is fairly well covered with brons, bánj, and ayár forest, in which the first greatly preponderates. Some tilonj follows the ravines and kharsu just puts in an appearance at the top of the compartment. Chír of vigorous growth occurs scattered everywhere. Some of the bánj trees are very large.

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chír ...	55	5,500	2,200	55	3,300	1,375	46	920	552	95	...	665
Oaks ...	305	...	27,450	255	...	10,200	162	...	2,430	163	...	652
Ayár and brons ..	287	...	10,045	629	...	11,322	1,040	...	6,240	1,292	...	1,938
Sál ...	...	...	...	...	...	...	...	...	...	...	...	...
Sain ...	...	...	...	...	...	..	...	...	...	...	...	...
Cypress ...	...	...	...	..	...	...	...	...	...	...	...	...
Total ...	647	5,500	39,695	939	3,300	22,897	1,248	920	9,222	1,550	...	3,255

Reproduction.—On the easterly face the more gentle slopes contain a fair show (co-efficient 0·4) of bánj chiefly and chír. On the northerly slopes young bánj and ayár coppice is plentiful (co-efficient of completeness 0·6). On the westerly aspect young coppice of the same species is filling up the glades. New reproduction by seed is, however, everywhere rare.

Grazing.—Slight.

Export lines.—The Pangot-Jákh district bridle-road forms the eastern boundary, as well as traverses the northern end, of the compartment.

China 20.

Boundaries.—North, ridge and spur separating compartment from China 22; east, spur and deep ravines separating it from China 19 and 21; south, China 18, west, outer boundary of the forest and spurs separating compartment from China 17.

Area.—235 acres, of which 40 unproductive.

Configuration and aspect.—This compartment is situated on three sides of a mammillary hill. The gradients vary from 15° to 40,° the average being about 25°. The sides of the hill are furrowed by numerous ravines and gullies, the majority of which run down east or north-east into the Binaik raula. The predominant aspect (three-fourths of the compartment) is east, the remaining slopes looking for the most part north.

Elevation.—Maximum 7,570 feet, minimum 5,900 feet, mean about 6,800 feet.

Soil and underlying rock.—A sandy loam, generally deep, rich in the deeper ravines and gullies, resting on shales and freely-fissured sandstone; excellent for bánj, tilonj, and brons forest.

Stock.—Excepting the crests of prominent spurs, which are crowned with rather open (density 0·5) forest of chír consisting mainly of tall, well-grown, middle-aged and old trees, the stock consists principally of bánj and brons, with a large proportion of ayár and, in the moister portions, of tilonj also. The deeper ravines and gullies are very nearly completely stocked, the trees being of vigorous growth and attaining large dimensions. Nearly all the remaining portions of the area have been formerly under cultivation and contain only a few scattered, stunted, sickly trees, standing in the midst of total blanks or a more or less dense undergrowth of thorny shrubs.

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chír ...	52	5,200	2,080	76	4,560	1,900	91	1,820	1,092	47	...	329
Oaks ...	673	...	60,470	733	...	29,320	1,113	...	16,695	2,531	...	10,124
Ayár and brons ...	464	...	16,240	720	...	12,960	1,552	...	9,132	3,489	...	5,233
Sál ...	...	...	...	...	...	...	...	...	...	...	...	...
Sain ...	...	...	...	...	...	...	...	...	...	...	...	...
Cypress ...	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	1,189	5,200	78,890	1,529	4,560	44,180	2,756	1,820	26,919	6,067	...	15,686

Reproduction.—Saplings and seedlings of chír are very rare, as also new seedlings of the other counted species, young coppice of which latter, however, is, as already said, abundant in many places (co-efficient 0·4 to 1·0). The thick undergrowth of thorny shrubs, and, in the moister places, of ringals, impedes reproduction very considerably.

Grazing.—Heavy in places.

Export lines.—The Pangot-Jákh district bridle-road cuts through the western corner of the compartment.

Chína 21.

Boundaries.—North, outer boundary of the forest ; east, prominent ridge separating compartment from Budhlákot 1 and village of Churáni ; south, Pangot-Jákh bridle-road ; west, spurs and streams separating compartment from Chína 20 and 22.

Area.—158 acres, of which 30 unproductive.

Configuration and aspect.—This compartment occupies the narrow basin of the lower part of the Binaik raula and that of one of its feeders, which comes down from the Burha Pátál. The ground in the lower fourth of the compartment consists of more or less easy slopes (15° to 30°) that were formerly under cultivation. Above this, *i. e.*, in the entire basin of the sot feeding the Binaik raula, there are numerous deep ravines, and the gradients seldom run below 32°, often becoming precipitous. The general fall of the ground is from north to south, but the central streams produce westerly and, in a minor degree, easterly aspects.

Elevation.—Maximum 7,965 feet, minimum 5,900 feet, mean about 6,600 feet.

Soil and underlying rock.—A sandy loam, deep and rich on the easy slopes at the lower end of the compartment and in all ravines ; shallow and often absent everywhere else ; resting on shales and freely-fissured sandstone, the latter of which is frequently quartzitic where it crops out in the upper half of the compartment. Good soil for bánj, brons, and tilonj.

Stock.—The crests of the spurs on the right bank of the main sot bear a few scattered chír of good size, and at the bottom of the compartment is to be found a small and dense patch of vigorous chír. Otherwise the stock is composed chiefly of bánj and brons, with tilonj and ayár, the former of which two species becomes very numerous in the higher portions of the compartment. The density of this oak and brons forest varies from 1·0 in the ravines gradually to 0·6 on the higher slopes. The bánj and tilonj trees are generally very vigorous.

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chír ...	77	7,700	3,080	141	8,460	3,525	203	4,060	2,436	205	...	1,435
Oaks ...	774	...	69,660	816	...	32,640	1,019	...	15,285	3,919	...	14,676
Ayár and brons ...	247	...	8,645	506	...	9,108	917	...	5,502	3,198	...	4,797
Sál ...	...	...	...	...	...	...	...	...	...	...	...	...
Sain ...	...	...	...	...	...	...	...	...	...	...	...	...
Cypress ...	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	1,098	7,700	81,385	1,463	8,460	45,273	2,139	4,060	23,223	7,322	...	20,908

Reproduction.—Backward (co-efficient 0·3) in the upper half of the compartment ; excellent (0·6 to 0·9) elsewhere, especially in chír forest.

Grazing.—Slight.

Export lines.—The Pangot-Jákh district bridle-road forms the southern boundary of the compartment.

Chína 22.

Boundary.—North, outer boundary of the forest and a detached field ; east, spur separating compartment from Chína 21 ; south, Chína 20 and 21 ; west, outer boundary of the forest.

Area.—220 acres, of which 35 unproductive

Configuration and aspect.—This compartment occupies the broad open basin formed by the head-waters of the Binaik raula. At the lower end of this basin there are about 40 acres of gentle slopes; otherwise the gradients are steep, varying from 25° to 45°. The spurs between the numerous watercourses are more or less rounded. The general fall of the ground is south-eastwards, but the varying contour of the sides of the basin produces all four aspects, *viz.*, northerly, easterly, southerly, and westerly, in equal proportions.

Elevation.—Maximum 8,200 feet, minimum 6,200 feet, mean about 6,900 feet.

Soil and underlying rock.—A sandy loam, deep and rich in the ravines and gullies, more or less shallow elsewhere, especially on the higher spurs and ridges, where the underlying shales and thinly-bedded sandstones crop out. Excellent soil for bánj, tilonj, and brons.

Stock.—The stock is composed essentially of bánj, brons, tilonj, and ayár, the tilonj being confined to the better and moister soils. The sites of old cultivation at the bottom of the compartment are either blank or contain more or less dense young coppice of those species; otherwise the stock is very nearly complete. Vegetation is very vigorous and the trees attain magnificent dimensions.

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chír ...	14	1,400	560	11	660	275	11	220	132	19	...	133
Oaks ...	984	...	88,560	1,457	...	58,280	2,284	...	34,260	9,126	...	36,504
Ayár and brons ...	494	...	17,290	782	...	14,076	2,001	...	12,006	7,727	...	11,590
Sál ...	...	...	...	...	...	...	...	...	...	...	...	...
Sain ...	...	...	...	...	...	...	...	...	...	...	...	...
Cypress ...	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	1,492	1,400	1,06,410	2,250	660	72,631	4,296	220	46,398	16,872	...	48,227

Reproduction.—There is very little room for new reproduction; nevertheless, numerous seedlings of tilonj and bánj are found under the old trees and in the small gaps in the midst of dense forest.

Grazing.—Nil.

Export lines.—Nil.

CHAPTER VIII.—AYÁRPÁTA BLOCK.

Boundaries.—North, east, and west, Naini Tál station; south, sharp ridge separating compartment from proposed reserved forest.

Area.—193 acres, of which 30 unproductive: only a single compartment.

Configuration and aspect.—This compartment occupies the western face of the Ayárpáta hill above the Naini Tál-Kiládhúngi bridle-road, a broad shallow bay formed by a much-branched stream feeding the Saria Tál. At the top of the bay the ground exhibits undulating contours (gradients 15° to 12°), but elsewhere the slopes are generally very much broken and the gradients exceed 30°.

Elevation.—Maximum 7,721 feet, minimum 5,700 feet, mean about 5,700 feet.

Soil and underlying rock.—A free rich loam, of very variable depth, sometimes exposing the underlying krol limestone and sandstone. Large boulders of the limestone occur in many places. Excellent soil for oaks, especially tilonj.

Stock.—The density of the stock varies very much, but the average figure is as high as 0·7. The forest consists chiefly of tilonj at the higher elevations and bánj below, all the trees tall and well grown, few of the boles being less than 20 feet long.

Summary of valuation.

Species.	Class I.			Class II.			Class III.			Class IV.		
	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.	Number of trees.	Cubic feet of timber.	Maunds of fuel.
Chír ...	...	...	...	...	...	...	...	...	...	...	...	...
Oaks ...	731	...	65,790	667	...	26,680	1,278	...	19,170	6,495	...	25,980
Ayár and brons ...	42	...	1,470	57	...	1,026	112	...	672	458	...	687
Sál ...	...	...	...	...	...	...	..	...	...	...	...	...
Sain ...	...	...	...	...	...	...	...	...	...	...	...	...
Cypress ...	1	120	40	1	70	30	3	75	30	2	...	20
Total ...	774	120	67,200	725	70	27,736	1,393	75	19,872	6,955	...	26,687

Reproduction.—In some places the advance growth is complete, in others wanting, but the average co-efficient may be put down at 0·6. Young seedlings are generally rare or are concealed under a dense growth of ferns, ringals, &c. In August, 1875 a plot of about 5 acres that had been cleared for potato cultivation was sown with tilonj. The work has been a complete success.

Grazing.— Nil.

Export lines.—The Naini Tál-Kíládhúngi bridle-road runs along the boundary of the compartment for nearly two miles.

*The results of the enumeration survey made are shown in the following statement :—

Species.	Diameter-class.	Area 193 acres. Gross number of trees.	Number of trees per acre.
Cypress	I	1	0·00
	II	1	0·00
	III	3	0·02
	IV	2	0·01
Total ...	...	7	0·03
Phanyáth	I	...	...
	II	...	...
	III	...	...
	IV	1	0·00
Total ...	...	1	0·00
Bánj	I ...	397	2·05
	II	352	1·82
	III	728	3·77
	IV	2,486	12·88
Total ...	...	3,962	20·53
Tilonj	I	335	1·74
	II	313	1·62
	III	549	2·84
	IV	4,003	20·74
Total ...	...	5,200	26·94
Kharsu	I	...	...
	II	2	0·01
	III	1	0·00
	IV	5	0.03
Total ...	...	8	0·04
Ayár	I	3	0·02
	II	11	0·06
	III	27	0·14
	IV	166	0·86
Total ...	...	207	1·07
Brons	I	39	0·20
	II	46	0·24
	III	85	0·44
	IV	292	1·51
Total ...	...	462	2·39
Grand Total ...	...	9,847	51·00

PART III.

THE ORGANIZATION SCHEME.

THE proposals which together constitute the organization scheme will be formulated in eight several chapters as under :—

I. Method of Exploitation.

II. Age of Exploitability.

III. Period of currency of Present Working-plan.

IV. Estimate of Exploitable Material.

V. General Scheme of Exploitations for 60 years.

VI. Specific proposals for First Decennium.

VII. Forecast of stock at close of 60-years Period.

VIII. Scrutiny and Revision of General Scheme of Exploitations.

CHAPTER I.—METHOD OF EXPLOITATION.

Considering (i) the steepness of the gradients, (ii) the great elevation and free exposure to storms, (iii) the instability of the hill sides, and (iv) the barrenness of the soil without a complete cover of trees, there can be no hesitation in maintaining the system of jardinage.

CHAPTER II.—AGE OF EXPLOITABILITY.

The jardinage system being followed, there can manifestly be no true rotation with a gradation of separately distributed age-classes.

The chír areas must obviously be worked with the main object of obtaining from them the largest quantity possible of timber, which is the great desideratum in these forests. The larger the trees are when felled, provided they are still sound, the better, for the amount of waste in conversion diminishes in geometrical ratio as the diameter increases. But in each case a natural limit to exploitable size is imposed by the prevailing conditions of soil and climate. In the present instance, the average diametral growth of chír becomes very slow after 130 years, at which age the average diameter at breast-height is only 5 feet. But, on the other hand, it must be remembered that the amount of waste in converting trees of only 5 feet girth is disproportionately large, not only because of the small girth, but also of the comparatively rapid taper of the trunk upwards, which reduces the utilizable length of bole and diminishes in a singular manner the yield of the upper logs. Hence the mean annual rate of increase in respect of convertible timber goes on increasing for several years, even after the mean annual rate of diametral growth has fallen off very considerably. We may, therefore, fix the average girth of the exploitable chír tree at 6 feet, when it will be, under the present circumstances at least, about 170 years old. In saying this it is not meant that no tree under 6 feet girth should ever be felled. The least promising trees will manifestly attain their maximum mean annual rate of growth long before they can reach that size, and some may thus become exploitable even when only 5 feet in girth.

The ages of sál and sain for the various girths being, under the circumstances explained on pages 24-25, undetermined, the exploitability of those species must be a very variable factor, depending exclusively on sylvicultural considerations and the demand.

The exploitability of other trees yielding timber, such as cypress, ash, &c., need not be considered, as their numbers are insignificant.

As regards oak and other principally or exclusively fuel-yielding trees, the crops containing them should be exploited so as to yield absolutely the largest quantity of sound wood. Reference to the figures on pages 20-21 and 23-24 will show that in the case of individuals of the various oaks and of brons, the most extensively distributed of those species, the mean annual production goes on increasing up to a very advanced age. But, on the other hand, those trees, after they have attained a girth of over 5 feet, spread out their crowns very considerably, to the great detriment of overtopped or immediately neighbouring young individuals that have already reached the phase of rapid upward development. Hence, except in the case of such young individuals of the better species being either absent or not sufficiently numerous, oaks and brons ought generally to be removed on attaining a girth of just over 5 feet, *i. e.*, when they are from 110 to 120 years old.

CHAPTER III.—PERIOD OF CURRENCY OF PRESENT WORKING PLAN.

The principal desideratum in the Naini Tál forests being timber, the first object to be fulfilled by any measures devised for working them should hence be the increase of the timber supply.

The valuation survey of the stock having been based on girth-classes starting at 18 inches and rising successively by 18 inches, it is evident that the general proposals for working and treatment cannot be framed on a narrower basis than the average period required by the present chír and sál and sain trees of the second class to pass into the first class, *i. e.*, 60 years.

As regards oak and brons, not only will second class individuals, but also a large proportion, certainly 50 and 33 per cent. respectively, of those of the third class, become first class trees within this period of time.

In the present state of our knowledge of the conditions of reproduction in these forests we cannot look so far ahead as 60 years in prescribing the detailed procedure to adopt : hence, although the general framework of the present working plan must necessarily cover the entire period of 60 years, its special provisions will embrace an interval of only ten years. By the end of that interval, the effect of the treatment and work carried out under those provisions, and the productive capacity of the area now being demarcated from the defunct Iron Company's forests, and of any other tract or tracts that may, in the meanwhile be added on to the Naini Tál sub-division in order to supplement the present notoriously inadequate stock of timber, will have been specially studied and be sufficiently understood to justify and even call for a revision of details. The various points to which this revision will chiefly extend are explained in Chapter VIII.

CHAPTER IV.—ESTIMATE OF EXPLOITABLE MATERIAL.

The period of currency of the present working plan having been fixed in the preceding chapter, the next step is to estimate the quantity of exploitable material. As the original or protected area of the sub-division has been carefully surveyed by a working plans party, while the recently added area, the demarcation of which is still incomplete and which is to be formed into a reserve, has of necessity been examined only in a cursory manner, this estimate must obviously be given separately for the two several portions.

SECTION I.—THE PROTECTED AREA.

After what has been said in Chapter III, it is evident that the estimate must be made for 60 years—that is to say, the figures entered in the subjoined statement give the amount of material it is considered permissible to take out during the next 60 years.

The estimate in question is of course based on the number of trees of the various girth-classes counted in the enumeration survey (see statement on pages 26-27), and is deduced therefrom in accordance with the following rules and assumptions :—

(1) All trees above six feet in girth, except such as are required as seed-bearers or nurses, to be cut. The number coming under the exception will, however, be so insignificant that it has been left out of account altogether in the subjoined estimate.

(2) Ayár above 4 feet 6 inches and up to 6 feet in girth to be also cut, with the exception of about 20 per cent. in the aggregate, which, in the present open state of the stock will have to be preserved for purely sylvicultural reasons.

(3) Oak and brons above 5 feet in girth, also smaller individuals belonging to the second class, which are unsound or are in their decline, to be felled, saving such exceptions as the exigencies of sylviculture may require. The proportion of the entire stock of second class oak and brons that will be felled in accordance with the above rule will be approximately 30 per cent.

(4) As regards all other individuals of the counted species not referred to in the preceding rules, the number that cannot survive or ought not (because they are unsound or have ceased to grow rapidly enough, or because they stand too close to and injure other trees more valuable than themselves) to be preserved until they reach the next higher girth-class, are more or less as under :—

	Chír.	Sál and sain.	Oaks.	Brons.	Ayár.
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Second class	50	30	...	...	...
Third „	30	40	40	50	60
Fourth „	40	40	40	40	40

(5) Owing to small size or unsoundness or knottiness and to breakages due to precipitous ground, only the following percentages of the quantity of chír, sál, and sain exploitable in accordance with rules 1 to 4 will be fit for conversion into timber :—

	Chír	Sál.	Sain.	Per cent.
	Per cent.	Per cent.	Per cent.	
First class about	50	40	40	...
Second „ „	40	33	40	...
Third „ „	33	40	40	...
Fourth „ „	...	40	...	...

To resume the foregoing rules and assumptions.

The proportion of trees to fell during the next 60 years out of the total number *now* standing in the forest will be more or less as under :—

	Girth class.				
	I.	II.	III.	IV.	
Chír	All	50	30	40	per cent.
Sál, sain, and oaks	„	30	40	40	„
Brons	„	30	50	40	„
Ayár	„	80	60	40	„

What is said under (5) is intelligible at a glance and therefore requires no résume.

Material exploitable during

Species.	Girth-class.	Nalena. Number of trees utilizable for: Timber.	Nalena. Number of trees utilizable for: Fuel only.	Nalena. Cubic feet of timber	Nalena. Maunds of firewood.	Kuria. Number of trees utilizable for: Timber.	Kuria. Number of trees utilizable for: Fuel only.	Kuria. Cubic feet of timber.	Kuria. Maunds of firewood.
Chír ...	I	250	239	25,000	34,315	26	27	2,600	3,335
	II	316	480	18,960	32,860	30	50	1,800	3,350
	III	570	1,153	11,400	20,676	20	44	400	1,164
	IV	...	6,535	...	45,745	...	85	...	595
Totals ...		1,136	8,407	55,360	133,596	76	206	4,800	8,444
Oaks ...	I	...	459	...	41,310	...	47	...	4,230
	II	...	816	...	32,640	...	87	...	3,480
	III	...	1,350	...	20,250	...	151	...	2,265
	IV	...	3,493	...	13,972	...	406	...	1,624
Totals ...		...	6,118	...	208,172	...	691	...	11,599
Brons ...	I	...	74	...	2,590	...	...	...	...
	II	...	169	...	3,042	...	...	...	...
	III	...	935	...	5,610	...	...	...	...
	IV	...	2,360	...	3,540	...	...	...	...
Totals ...		...	3,538	...	14,782	...	...	...	...
Ayár ...	I	...	30	...	1,050	...	...	...	...
	II	...	120	...	2,160	...	...	...	...
	III	...	576	...	3,456	...	...	...	...
	IV	...	1,557	...	2,335	...	...	...	...
Totals ...		...	2,283	...	9,001	...	...	...	...
Súl ...	I	40	59	2,000	6,720	10	24	500	2,420
	II	116	200	3,480	9,920	13	28	390	1,324
	III	498	600	4,980	12,384	37	60	370	1,136
	IV	1,937	2,500	3,874	20,248	105	170	210	1,270
Totals ...		2,591	3,359	14,334	49,272	165	282	1,470	6,150
Sain ...	I	50	70	2,500	8,700	2	6	100	620
	II	95	120	2,850	6,460	6	18	180	804
	III	209	280	1,672	6,290	20	44	160	860
	IV	...	1,359	...	8,154	...	141	...	846
Totals ...		354	1,829	7,022	29,604	28	209	440	3,130
Grand Total ...		9,784	19,831	76,716	444,427	269	1,388	6,710	29,323

first 60-year period.

Laria Kánta.				Bhawáli.			
Number of trees utilizable for		Cubic feet of timber.	Maunds of firewood.	*Number of trees utilizable for*		Cubic feet of timber.	Maunds of firewood.
Timber.	Fuel only.			Timber.	Fuel only.		
104	104	10,400	13,000	945	868	94,500	111,580
145	220	3,700	15,085	1,362	2,900	81,720	181,850
180	379	8,600	10,119	2,600	5,318	52,000	111,678
...	2,852	...	19,964	...	27,382	...	191,674
429	3,555	22,700	58,168	4,907	36,468	228,220	599,782
...	4,875	...	438,750	...	3,264	...	293,760
...	4,154	...	166,160	...	4,323	...	172,920
...	4,425	...	66,375	...	7,757	...	116,355
...	8,819	...	35,276	...	25,168	...	100,672
...	22,273	...	706,561	...	40,512	...	683,707
...	1,104	...	38,640	...	362	...	12,670
...	1,885	...	33,930	...	958	...	17,244
...	3,654	...	21,924	...	2,724	...	16,344
...	7,412	...	11,118	...	10,218	...	15,327
...	14,055	...	105,612	...	14,262	...	61,585
...	144	...	5,040	...	35	...	1,225
...	367	...	6,606	...	174	...	3,132
...	1,295	...	7,770	...	999	...	5,994
...	3,228	...	4,842	...	3,984	...	5,976
...	5,034	...	24,258	...	5,192	...	16,327
...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...
...	...	...	...	1	...	50	55
...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...
..	...	...	...	1	...	50	55
429	44,917	22,700	894,599	4,908	96,434	228,270	1,361,456

Material exploitable during

Species.	Girth-class.	Budhlakot. Number of trees utilizable for: Timber.	Budhlakot. Number of trees utilizable for: Fuel only.	Budhlakot. Cubic feet of timber.	Budhlakot. Maunds of firewood.	Jakh. Number of trees utilizable for: Timber.	Jakh. Number of trees utilizable for: Fuel only.	Jakh. Cubic feet of timber.	Jakh. Maunds of firewood.
Chír ...	I	500	629	50,000	79,415	350	531	35,000	59,135
	II	880	1,320	52,800	90,640	228	350	13,680	23,900
	III	1,200	2,430	24,000	65,430	160	325	3,200	8,745
	IV	...	6,809	...	47,663	...	2,449	...	17,143
Totals ...		2,580	11,258	126,800	283,148	738	3,655	51,880	108,923
Oaks ...	I	...	2,278	...	205,020	...	3,094	...	278,460
	II	...	2,229	...	89,160	...	2,221	...	88,840
	III	...	2,542	...	38,130	...	1,897	..	28,455
	IV	...	5,486	...	21,944	...	3,676	...	14,704
Totals ...		...	12,535	...	354,254	...	10,888	...	310,459
Brons ...	I	...	327	...	11,445	...	1,930	...	67,550
	II	...	537	...	9,666	...	1,030	...	18,540
	III	...	1,262	...	7,572	...	3,564	...	21,384
	IV	...	4,085	...	6,128	...	4,893	...	7,339
Totals ...		...	6,211	...	34,811	...	11,417	...	114,813
Ayár ...	I	...	21	...	735	...	381	...	13,335
	II	...	110	...	1,980	...	496	...	8,928
	III	...	446	...	2,676	...	1,089	...	6,534
	IV	...	2,176	...	3,264	...	2,126	...	3,189
Totals ...		...	2,753	...	8,655	...	4,092	...	31,986
Sál ...	I	...	...	...	...	...	...	...	...
	II	...	...	...	...	...	...	...	...
	III	...	...	...	...	...	...	...	...
	IV	...	...	...	...	...	...	...	...
Totals ...		...	...	...	...	...	...	...	...
Sain ...	I	3	...	150	165	...	...	...	...
	II	...	...	...	...	...	...	...	...
	III	...	...	...	...	...	...	...	...
	IV	...	...	...	...	...	...	...	...
Totals ...		3	...	150	165	...	...	...	...
Grand Total ...		2,583	32,757	126,950	681,033	738	30,052	51,880	566,181

first 60-year period—(concluded).

China.				Entire Area.			
Number of trees utilizable for		Cubic feet of timber.	Munds of firewood.	*Number of trees utilizable for*		Cubic feet of timber.	Maunds of firewood.
Timber.	Fuel only.			Timber.	Fuel only.		
170	174	17,000	21,590	2,345	2,642	2,34,500	3,22,370
91	150	5,460	10,075	3,052	5,470	1,83,120	3,60,760
50	113	1,000	2,973	4,780	9,762	9,5600	2,20,785
...	252	...	1,764	...	46,364	...	324,548
311	689	23,460	36,402	10,177	64,238	5,13,220	12,28,463
...	8,567	...	7,71,030	...	22,584	...	20,32,560
...	6,718	...	2,68,720	...	20,548	...	8,21,920
...	7,912	...	1,18,680	...	26,034	...	3,90,510
...	22,192	...	88,768	...	69,240	...	2,76,960
...	45,389	...	12,47,198	...	1,38,406	...	35,21,950
...	2,724	..	95,340	...	6,521	...	2,28,235
...	3,213	...	57,834	...	7,792	...	1,40,256
...	4,625	...	27,750	...	16,764	...	100,584
...	9,274	...	13,911	...	38,242	...	57,363
...	19,836	...	1,94,835	...	69,319	...	5,26,438
...	225	...	7,875	..	836	...	29,260
...	498	...	8,964	..	1,765	...	31,770
...	1,930	...	11,580	...	6,335	...	38,010
...	5,537	...	8,806	...	18,608	...	97,912
...	8,190	...	36,725	...	27,544	...	126,952
...	...	...	...	50	83	2,500	9,140
...	...	...	...	129	228	3,870	11,244
...	...	...	...	535	660	5,350	13,520
...	...	...	...	2,042	2,670	4,084	21,518
...	...	...	...	2,756	3,641	15,804	55,422
...	...	...	...	56	76	2,800	9,540
...	...	...	...	101	138	3,030	7,264
...	...	...	...	229	324	1,832	7,150
...	...	...	...	...	1,500	...	9,000
...	...	...	...	386	2,038	7,662	32,954
311	74,104	23,480	15,15,160	13,319	3,05,186	5,36,686	54,92,179

To the preceding total figure for firewood must be added the following :—

		Mds.
Estimated yield of the uncounted species in the surveyed area	...	1,800,000
Ditto standing poles under 18 inches in girth of counted species in surveyed area.		2,000,000
Ditto trees in unsurveyed area	...	800,000
Ditto thinnings in new generation to be established	...	1,000,000
Total	...	5,600,000

Thus making, with the sawing refuse, in round numbers, a grand total of about 11,200,000 maunds of exploitable firewood. This excludes Ayárpáta, which can give 150,000 maunds, but the outturn of which has not been taken into account, as there is every probability of its being shortly exchanged with the municipality against the forest included in the bay north of the Saint Loo Gorge.*

Since the preceding figures were computed the following chír trees have been taken out in the timber operations ;—

		Girth-class			
		I.	II.	III.	Total.
Bhawali	1	64	108	2	174
„	3	10	31	0	41
„	14	22	21	0	43
„	12	1	0	0	1

Section II.—The Proposed Reserved Forest.

Owing to the circumstances detailed on page 28, it is possible to estimate the amount of exploitable material only in respect of chír. This estimate is exhibited in the subjoined tabular statement, and has been based on the same principles and assumptions as that for the protected area, except that in consequence of the remarkably small proportion of individuals of the lower girth-classes and the open state of the stock, a larger percentage of those individuals has been indicated for preservation.

* Since the working plan has been in the press the exchange referred to has been effected.

Species.	Girth-class.	(B-D) Number of trees utilizable for: Timber.	(B-D) Number of trees utilizable for: Firewood only.	(B-D) Cubic feet of timber.	(B-D) Maunds of firewood.	(E) Number of trees utilizable for: Timber.	(E) Number of trees utilizable for: Firewood only.	(E) Cubic feet of timber.	(E) Maunds of firewood.	(F) Number of trees utilizable for: Timber.	(F) Number of trees utilizable for: Firewood only.	(F) Cubic feet of timber.	(F) Maunds of firewood.	(G-J) Number of trees utilizable for: Timber.	(G-J) Number of trees utilizable for: Firewood only.	(G-J) Cubic feet of timber.	(G-J) Maunds of firewood.	(K-P) Number of trees utilizable for: Timber.	(K-P) Number of trees utilizable for: Firewood only.	(K-P) Cubic feet of timber.	(K-P) Maunds of firewood.	(Q-R) Number of trees utilizable for: Timber.	(Q-R) Number of trees utilizable for: Firewood only.	(Q-R) Cubic feet of timber.	(Q-R) Maunds of firewood.	(S) Number of trees utilizable for: Timber.	(S) Number of trees utilizable for: Firewood only.	(S) Cubic feet of timber.	(S) Maunds of firewood.	Grand Totals. Number of trees utilizable for: Timber.	Grand Totals. Number of trees utilizable for: Firewood only.	Grand Totals. Cubic feet of timber.	Grand Totals. Maunds of firewood.
Chir ...	I	120	78	12,000	11,430	50	38	5,000	5,230	28	18	2,800	2,650	400	310	40,000	42,350	1,120	522	112,000	89,170	480	250	48,000	40,960	50	28	5,000	4,380	2,248	1,250	224,800	196·170
	II	110	70	6,600	6,390	25	15	1,500	1,405	18	12	1,080	1,074	300	200	18,000	17,900	970	580	58,200	54,410	230	120	13,800	11,990	60	30	3,600	3,060	1,713	1,027	102,780	96,229
	III	170	160	3,400	5,400	30	30	600	990	30	30	600	990	250	250	5,000	8,250	980	780	19,600	28,140	20	20	400	660	80	70	1,600	2,430	1,560	1,340	31,200	46,860
	IV	...	2,600	...	18,200	...	100	...	700	...	100	...	700	...	400	...	2,800	...	2,960	...	20,720	...	40	...	280	...	400	...	2,800	...	6,600	...	46,200
Totals ...		400	2,908	22,000	41,420	105	183	7,100	8,325	76	160	4,480	5,414	950	1,160	63,000	71,300	3,070	4,842	189,800	202,440	730	436	62,200	43,890	190	528	10,200	12,670	5,521	10,217	358,780	385,459

Besides the above there will be about 42,000 cubic feet of timber available from the trees that were either too scattered or standing in too small patches to be counted within the time at my disposal.

Although sál covers a comparatively large area, (1,000 acres), very little of it is fit for timber.

As regards fuel, we may roughly estimate the total quantity as follows :—

	Maunds.
Yield of counted chír trees	400,000
Ditto uncounted chír trees above 18 inches in girth	50,000
Ditto chír poles under 18 inches in girth	50,000
Ditto oaks in present standing stock*	400,000
Ditto sál and sain in present standing stock*	1,000,000
Ditto other species in present standing stock*	3,500,000
Ditto thinnings in new generation to be established	500,000
Total ...	6,500,000

That this statement is not excessive will be apparent from the fact that, as the area of the forests will be about 17,530 acres, it is equivalent to less than 7 cubic feet per acre per annum.

Section III.—Summary.

The results obtained in the two preceding sections would be summarised thus :—

	Timber. C. ft.	*Firewood.* Maunds.
Protected area	536,686	11,000,000
Proposed reserve	358,780	6,500,000
Total ...	895,466	17,500,000

The requirements of right holders, as shown in Part I, will be for the 60 years :—

Species of trees.	*In the protected forest.*				*In the proposed reserve.*			
	Girth-class.	Number of trees.	Cubic feet of timber.	100lb maunds of firewood.	Girth-class.	Number of trees.	Cubic feet of timber.	100lb maunds of firewood.
Counted chír	I	1,284	128,400	51,360	I	1,920	192,000	76,800
	II	396	23,760	9,900	II	600	36,000	15,000
	III	1,408	28,160	16,896	III	2,160	43,200	25,920
	IV	3,848	...	26,936	IV	5,940	...	41,580
Fuel and other trees, counted and uncounted.		...	...	2,894,908		...	...	2,240,700
		6,936	180,320	3,000,000		10,620	271,200	2,400,000

thus leaving at the free disposal of the Department :—

Counted chír	I	1,061	106,100	42,440	I	328	32,800	13,120
	II	2,656	159,360	66,400	II	1,113	66,780	27,825
	III	3,372	67,440	40,464	III	...	...	
	IV	42,516	...	297,612	IV	...	...	...
Fuel and other trees, counted and uncounted.		...	...	7,753,084		...	...	4,059,055
		49,605	332,900	8,200,000		1,441	99,580	4,100,000

* The stock in the forest has been classified roughly as follows (see also map) :—

Under the chír type	3,500 acres.
„ oak „	1,700 „
„ sál „	1,600 „
„ miscellaneous type	9,800 „
Blank or unproductive	1,530 „
Total ...	17,530 „

CHAPTER V.—GENERAL SCHEME OF EXPLOITATION FOR THE NEXT 60 YEARS.

This scheme may be shortly exhibited in tabular form thus :—

Whether timber or firewood.	Items to be supplied.	Extent of requirements.	To be supplied from			
			Protected area.	Proposed reserve.	Ninglát forests.	Other sources.
		Cubic feet.	Cubic feet.	Cubic feet.	Cubic feet.	Cubic feet.
Timber	For right-holders (free) ...	551,520	180,320	271,200	100,000	...
	" others (for sale) ...	2,400,000	332,900	99,580	320,000	1,447,520
	Total ...	2,951,520	513,220	370,780	420,000	1,447,520
		Maunds.	Maunds.	Maunds.	Maunds.	Maunds.
Firewood.	For right-holders (free) ...	5,400,000	3,000,000	2,400,000	...	...
	" troops ...	1,600,000	1,000,000	50,000	550,000	...
	" residents within settlement.	4,800,000	3,400,000	1,000,000	400,000	...
	" wayfarers and for graziers and other residents outside settlement.	2,400,000	1,800,000	400,000	200,000	...
	" making hardwood charcoal.	4,800,000	1,700,000	2,500,000	600,000	...
	" making chír charcoal,	200,000	100,000	50,000	50,000	...
	" burning lime ...	300,000	200,000	100,000	...	...
		19,500,000	11,200,000	6,500,000	1,800,000	...

It will be observed that the Ninglát forests have been introduced into the scheme. A précis of the figures on which this working plan is based having been submitted demi-officially to Government and the Commissioner, it has been decided, in view of the notorious insufficiency of timber in the Naini Tál protected and (proposed) reserved forests, to transfer those forests very shortly from the civil authorities to the Forest Department. The forests in question stretch parallel to the Bhawáli Block on the opposite side of the Ninglát valley, and, as far as may be judged from an eye survey, will certainly yield at least 420,000 cubic feet of timber and 1,800,000 maunds of firewood, besides furnishing fuel to right-holders.

With respect to the term "other sources," it is clear that if the settlement is to be maintained, a sufficient supply of timber must under any circumstances be kept up. The balance that *must* be forthcoming from somewhere is 1,800,000 cubic feet.

At present there are no large chír forests under the control of the Department nearer than Ránikhet. The forests there contain enough material to be able to spare, during the 60 years, about 1,000,000 cubic feet for foreign export after supplying all local requirements. But the average distance of carriage, most of it by bullock-cart, will be about 45 miles, and would raise the value of the timber to the extent of 4½ annas, or about 33⅓ per cent., per sawn cubic foot all round. Hence, before committing ourselves to so important a step as the sudden raising of prices, we must be sure that we cannot utilize resources nearer home.

Within a radius of 15 miles of the settlement is situated, besides the Ninglát tract, a large stretch of chír forests occupying a valley running immediately north of, and parallel to, the Bhim Tál valley. I myself have not seen these forests, but Mr. Greig considers it sufficiently rich to dispel any apprehension of a failure in the timber supply of the Naini Tál settlement. As my time at Naini Tál was limited, Mr. Hearle very kindly made a rapid inspection of this chír tract and testifies to its great richness, although he can make no guess, however approximative, as regards its resources. No

doubt there will be no difficulty in adding also this area to the forests of the Naini Tál sub-division. If it should eventually prove insufficient to make up the total deficiency of 1,800,000 cubic feet, then Ránikhet could, in the last resource, be indented on ; and by that remote period some cheaper and less troublesome and slow method of carriage than the ordinary bullock-cart will have probably been devised.

CHAPTER VI.—SPECIFIC PROPOSALS FOR THE FIRST DECADE.

These proposals will be best grouped under the following seven heads to which they respectively relate :—

I.—The timber supply.
II.—Supply of Commissariat firewood.
III.— Ditto firewood to residents of the settlement.
IV.— Ditto ditto to graziers, wayfarers, and others in the forests.
V.— Ditto charcoal for cooking and smithy purposes.
VI.— Ditto fuel for burning lime.
VII.— Ditto grass and other minor produce.

SECTION I.—STRICTER DEFINITION OF SO-CALLED RIGHTS.

Before formulating proposals for work, it is necessary to solicit the attention of Government to the extremely unsatisfactory condition of these forests in respect of the so-called rights.

At present, grazing excepted, the most complete uncertainty prevails respecting the extent to which the villagers may claim to enjoy the usufruct of the forests. The only limit to that enjoyment is the limit to increase of population imposed by the maximum area that can be brought under cultivation here and in the Bhábar and Tarái. After harvesting their crops in the lowlands, the people can retire in any numbers to summer in these hills in order simply to avoid the hot unhealthy season below. The requirements of the indigenous population are thus an indeterminate quantity, which may at any time increase or fluctuate to such an extent as to render any steady and regular working of the forests quite impossible.

Even as it is, the provision made, out of the exploitable material the forests can furnish, for the satisfaction of the right-holders' wants is merely based on an average which may prove to be as delusive as the merest guess-work. The Divisional Officer may any day be flooded with requisitions for building timber that may swamp the entire yield of a year and thus throw out of gear the whole machinery of the working plan.

Such a state of things demands immediate remedy, and I would propose that the plan adopted with such complete success in the forests of Jaunsár in the Dehra Dun district, of fixing the number of trees each village can claim, be introduced in these forests. The fact of Mr. Ross, the originator of that system in Jaunsár, being now Commissioner of Kumáun is a happy augury for its successful introduction here.

SECTION II.—THE TIMBER SUPPLY.

The operations designed to supply the settlement and outlying villages with timber should run on similar lines to what they have hitherto followed—that is to say, petty individual demands, such as those of villagers and small purchasers who themselves convert the few trees they buy, should be given scattered trees, and the main operations for supplying the general public with boards and scantlings should be confined to those localities where exploitable trees are numerous enough for work to be concentrated and, therefore, easily organized and supervised.

Whether these larger operations should be carried out by departmental agency is a question for the local officers to decide. Suffice it to say here that the less hampered the Divisional Officer is with duties belonging purely to the province of a timber dealer, the more time will he command for his own legitimate work, which is the improvement of the standing stock and the enhancement of the productive powers of the soil. On the other hand, as has been shown on page 40, the public are willing to pay a very much higher rate per cubic foot of sawn timber if they can buy the wood ready sawn than if they have to fell and saw the standing trees themselves.

At present the only five localities in which chír trees are numerous enough for large operations are—(i) the area comprising Bhawáli 1, 14, 13, 4, 7, 9, 11, and 13; (ii) that comprising Budhlákot 1 and 2; (iii) the northerly and easterly slopes coming down from the Saim Dhár ridge; (iv) the forest near Mangoli, and (v) the forests on the Goria Deota-ki-Dhár round Buránsi. The first two are in the original protected forest, the remainder in the proposed reserve. These last, considering the heavy rights which they have to satisfy and the absence of conservancy in them, are not in a fit state to be worked during the first decennium. Hence, after the exploitation of the two areas in the protected forest has been completed, the work should extend at once to the Ninglát forests, commencing at the upper end of the valley and progressing in consecutive order downwards.

The order of work should, as nearly as possible, be as follows :—

1886-87 1887-88	Bhawáli 1, 14, 13, 4, 7, 9, 11, and 12.
1888-89 1889-90	Budhlákot 1 and 2.
1890-91 1891-92 1892-93 1893-94 1894-95 1895-96	The Ninglát forests.

The Ninglát forests should be at once put under fire conservancy in order to prepare the trees and soil for reproduction by 1890. It will be seen that by the procedure just laid down the whole amount of material estimated as exploitable during the full period of 60 years will not be removed from the areas assigned to the 10 years. For various reasons, partly sylvicultural and partly, as said before, connected with convenience and economy of working and export, it would be extremely unadvisable to do so, nor is it contemplated to remove annually from the protected forest only one-sixtieth of the total exploitable material in it, for it would be impossible to work out with profit so small a quantity of timber at a time.

Section III.—Supply of Firewood to the Troops.

This supply should, as heretofore, be arranged for by departmental agency, which is the only means of ensuring the successful execution of the jardinage fellings. The operations should, for economy's sake, be confined to a radius of about five miles round the commissariat fuel depôt.

The annual deliveries will consist as hitherto of (*a*) the utilizable refuse of the timber fellings within the given radius; (*b*) utilizable windfalls inside or near the areas in which the special fuel fellings referred to under (*c*) have taken place, or occurring elsewhere on a sufficiently large scale, as where the land has slipped, and (*c*) produce obtained by means of special fellings of standing trees in order to bring the total of (*a*) and (*b*) up to the required figure.

The special fellings should be made over a definite area each year, the areas worked in successive years following each other in their respective order of dates. As the quantity obtainable from (*a*) and especially (*b*) will necessarily vary very considerably from year to year, it is not possible to prescribe in a rigid manner the order of the fellings. But an attempt should be made to observe the following sequence :—

1886-87.			1887-88.			1888-89.			1889-90.			1890-91.		
Block and compartment.	Area in acres.	100lb. maunds of firewood exploitable during 60 years.	Block and compartment.	Area in acres.	100lb. maunds of firewood exploitable during 60 years.	Block and compartment.	Area in acres.	100lb. maunds of firewood exploitable during 60 years.	Block and compartment.	Area in acres.	100lb. maunds of firewood exploitable during 60 years.	Block and compartment.	Area in acres.	100lb. maunds of firewood exploitable during 60 years.
China ... 3	134	38,000	China ... 12	393	280,000	China ... 13	207	360,000	Jákh ... 1	71	68,000	Nalena ... 8	86	38,000
Ditto ... 4	138	200,000	Ditto ... 14	225	230,000	Jákh ... 9	155	200,000	Ditto ... 2	105	38,000	Ditto ... 9	68	18,000
Ditto ... 5	146	60,000							Ditto ... 3	325	25,000	Ditto ... 10	45	14,000
Ditto ... 6	170	26.000							Ditto ... 4	70	75,000	Ditto ... 11	56	20,000
Ditto ... 7	93	100,000							Ditto ... 5	167	70,000	Ditto ... 12	156	40,000
									Ditto ... 6	188	98,000	Ditto ... 13	104	45,000
									Ditto ... 7	145	180,000	Ditto ... 14	116	65,000
												Ditto ... 15	122	63,000
												Ditto ... 19	157	36,000
												Ditto ... 20	123	16,000
												Ditto ... 21	238	63,000
												Ditto ... 22	118	44,000
												Ditto ... 23	115	13,000
												Ditto ... 24	248	24,000
												Kuria ... 3	39	30,000
												Ditto ... 4	354	40,000
												Ditto ... 5	198	40,000
												Ditto ... 7	146	30,000
												Ditto ... 8	92	26,000
												Ditto ... 9	191	50,000
Total ...	681	424,000		618	510,000		362	560,000		1,071	554,000		2,772	715,000

1891-92.			1892-93.			1893-94.			1894-95.			1895-96.		
Block and compartment.	Area in acres.	100lb. maunds of firewood exploitable during 60 years.	Block and compartment.	Area in acres.	100lb. maunds of firewood exploitable during 60 years.	Block and compartment.	Area in acres.	100lb. maunds of firewood exploitable during 60 years.	Block and compartment.	Area in acres.	100lb. maunds of firewood exploitable during 60 years.	Block and compartment.	Area in acres.	100lb. maunds of firewood exploitable during 60 years.
Bhawáli ... 12	328	183,000	Laria Kánta ... 8	130	180,000	Bhawáli ... 17	135	150,000	Bhawáli ... 20	162	80,000	Laria Kánta ... 1	125	1,000
Ditto ... 13	124	67,000	Ditto ... 9	242	300,000	Ditto ... 18	88	58,000	Ditto ... 23	120	30,000	Ditto ... 2	129	48,000
Ditto ... 14	232	126,000	Ditto ... 10	205	160,000	Ditto ... 19	237	300,000	Ditto ... 24	193	112,000	Ditto ... 3	177	177,000
Ditto ... 15	120	90,000	Ditto ... 11	112	60,000	Ditto ... 28	89	80,000	Ditto ... 25	75	38,000	Ditto ... 4	219	100,000
Ditto ... 16	92	48,000							Ditto ... 26	86	39,000	Ditto ... 5	168	110,000
									Ditto ... 27	101	97,000	Ditto ... 6	208	48,000
									Ditto ... 29	70	40,000	Ditto ... 7	145	132,000
												Kuria ... 6	191	20,000
	896	514,000		689	700,000		549	588,000		807	436,000		1,362	636,000

Within the areas allotted to the several years of the decennium the fellings should be made only where they are most urgent from a sylvicultural point of view. In the neighbourhood of lime-kilns the requirements of these kilns will be first of all considered, only the disposable balance of the hard-wood portion of the fall being removed for the troops (see page 199). It will be noticed that no portion of the proposed reseve or the Ninglát forests is included within the circle of these special fellings. The neighbouring portions of the former are too poorly stocked and the latter tract is too remote for the purpose.

SECTION IV.—SUPPLY OF FIREWOOD TO CIVIL RESIDENTS OF THE SETTLEMENT.

The ticket system, which has on the whole worked very smoothly, should be continued. The ticket-holders will, as hitherto, scour the entire area of the forests as far as they can go for the day. The assiduity with which they clear out of the forest every stick of dead wood should be taken advantage of to obtain an improved stool-regrowth by cutting back all gnarled, unsound, unhealthy or damaged poles and large saplings of broad-leaved species in the areas of the special commissariat fuel fellings, and also to coppice or thin out within the same area all patches of dense shrubby growth which either interferes with reproduction, keeps back young seedlings of the better species, or has practically ceased to make any increment. These special improvement cuttings, besides yielding a large quantity of material, will get rid of all inferior stuff and badly-growing individuals and increase the mean annual increment of the stock in a very marked manner. But they will cost money. The incidental cost can, however, be recovered from the residents themselves by raising the present absurdly low value of the ticket, which is a premium for the European residents to entertain an army of liveried jhampánis.

SECTION V.—SUPPLY OF FIREWOOD TO GRAZIERS, WAYFARERS, AND OTHERS IN THE FORESTS.

No special fellings are necessary for these individuals. The graziers live mostly in or near the villages, and hence the only provision necessary in their case is to fell lightly or not at all for the commissariat firewood in their neighbourhood. Wayfarers are satisfied with mere dead sticks, of which there will always be an abundance along the roads. Our workmen will form by far the largest proportion of the residents of the forests, and they will help in clearing the coupes of all refuse, of which there will in every case be more than they can use up.

SECTION VI.—SUPPLY OF WOOD FOR CHARCOAL-BURNING.

This supply will come exclusively from the area outside the range of the special commissariat fuel operations. Charcoal is light and, weight for weight, four times as dear as wood, and can, therefore, bear a very much longer carriage.

For hard-wood charcoal the area outside the 5-mile radius stocked with broad-leaved trees should be divided into 10 equivalent portions and fellings made in one of these each year.

The fellings will be confined to the denser stocked portions of those divisions, and will partake of the nature of jardinage and improvement cuttings combined. All dead and dying trees will be felled, and where young growth is being kept back by trees of inferior species or such as are on the decline, the latter will also be removed.

Moreover all gnarled, unsound, and unhealthy poles and saplings will be cut back in order to throw up vigorous promising shoots. This last-mentioned operation should obviously be carried out departmentally. The trees to fall in the jardinage will be most economically felled by the agency making the charcoal. Whether that agency should be the State or private individuals is a question for the local officers to decide, but the six years' disastrous experience of charcoal manufacture and sale by the Department and feelings of pure self-respect should, it is imagined, be sufficient warning against a State Department undertaking the harassing and undignified office of a petty dealer.

I have not been able to examine the proposed reserve sufficiently closely enough to be able to establish the ten working annual divisions referred to above, but at the

desire of Mr. Greig the following are suggested, which fit in with the working for firewood for the troops and for the residents of the settlement :—

1886-87	Rúnsi block.
1887-88	Loichusáni „
1888-89	Budhlákot and Chína blocks.
1889-90	„ „ Jákh „
1890-91	Bhawáli block
1891-92	Nalena and Kuria blocks.
1892-93	Mangoli block.
1893-94	Saim Dhár „
1894-95	Adhora „
1895-96	Kharil and Dhabka blocks.

It is quite possible that in practice it will not be found possible strictly to adhere to this order of work.

The chír charcoal will be made exclusively from sawing refuse and the produce of improvement thinnings in chír areas beyond the range of the commissariat fuel operations.

Section VII.—Firewood for Lime-burning.

Two circumstances determine the limits from within which wood for this purpose should be obtained : (1) the immediate neighbourhood of the limestone, and (2) a sufficient distance from the commissariat fuel depôt and the station not to trench too much on the supply of firewood for the troops and for the residents of the station.

For the 10 years during which this working plan will remain current I would propose that lime for plaster and mortar be burnt half in the Rúnsi and Loichusáni blocks from boulders and pebbles in the bed of the Nihal, and half near Adhora with wood obtained from the Chína and Adhora blocks. The tufaceous and nodular deposits of limestone fit for making lime for white-wash is found in workable quantities only in the Nalena block between Jiolkot and Arukhán, but the amount of such lime required every year is so small that there will be no difficulty in obtaining a sufficiency of hard-wood fuel within a radius of half a mile of the kilns.

Section VIII.—Supply of Minor Produce.

No change in the present system is suggested, except that the brass ticket now applying only to firewood should also be made to cover the removal of fodder grass. At present there is no check on people who stray away from the roads and paths, because they can always excuse their presence by passing off as grass-cutters. Moreover, the people who profit by the grass growing in the forests should also be made to pay for the supervision exercised by the Department, as well as for an article that does not belong to them and which is paid for everywhere else. In the dry districts of Central India fodder grass is an important item of income to the owner of the land on which it grows.

Since I made, as a sample, turpentine and colophony or white resin from the crude chír resin, no steps have apparently been taken to create a demand for those products. Even if a few annas were realized from resin on each chír tree felled, the resulting revenue would be all profit.

CHAPTER VII.—FORECAST OF STOCK AT CLOSE OF THE 60 YEAR PERIOD.

The sub-period of 10 years is too short for any change to occur in the stock sufficiently marked to lend itself, in the present state of our knowledge of these forests, to the framing of a forecast of any value. It is, therefore, necessary to make a forecast for the entire period of 60 years in order to show what results the various proposals made in this working plan endeavour to secure, besides merely satisfying the present requirements.

At the end of the 60 years, only the following numbers of trees will remain out of the counted portion of the present standing stock :—

Species.	Girth-class.	Number of trees preserved from standing stock in							
		Nalena.	Kuria.	Laria Kánta.	Bhawáli.	Budhlá-kot.	Jákh.	Chína.	Entire area.
Chír	II	800	76	350	4,250	2,199	550	240	8,465
	III	4,030	140	1,290	18,460	8,400	1,130	370	33,820
	IV	9,820	130	4,290	41,080	10,200	3,670	390	69,580
Total ...		14,650	346	5,930	63,790	20,799	5,350	1,000	111,865
Oaks	II	300	40	1,700	1,800	1,000	900	2,800	8,540
	III	2,000	200	6,600	11,300	3,700	2,800	11,700	38,300
	IV	5,100	700	13,100	37,500	8,100	5,400	33,300	103,200
Total ...		7,400	940	21,400	50,600	12,800	9,100	47,800	150,040
Brons ...	II	200	...	800	400	200	900	1,400	3,900
	III	1,000	...	3,500	2,600	1,200	3,400	4,500	16,200
	IV	3,000	...	11,200	15,200	6,000	7,500	13,800	56,700
Total ...		4,200	...	15,500	18,200	7,400	11,800	19,700	76,800
Ayár ...	II	30	...	100	50	30	120	120	450
	III	400	...	900	700	300	800	1,200	4,300
	IV	2,200	3	4,700	5,900	3,200	3,100	8,200	27,303
Total ...		2,630	3	5,700	6,650	3,530	4,020	9,520	32,053
Sál	II	200	40	...	...	...	...	...	240
	III	1,600	150	...	...	...	...	...	1,750
	IV	6,700	410	...	...	...	...	...	7,110
Total ...		8,500	600	...	...	...	...	...	9,100
Sain	II	100	10	...	1	4	...	...	115
	III	700	150	...	7	39	...	...	896
	IV	2,200	250	...	15	133	...	...	2,598
Total ...		3,000	410	...	23	176	...	...	3,609
GRAND TOTAL ...		40,380	2,299	48,530	139,263	44,705	30,270	78,020	383,467

Hence the stock at the close of the 60 years will be approximately as follows :—

Species.	Girth-class.	Number of trees in								How estimated from preceding statement.
		Nalona.	Kuria.	Laria Kánta.	Bhawáli.	Budh-lákot.	Jákh.	Chína.	Entire area.	
Chír ...	I.	800	76	350	4,250	2,199	550	240	8,465	Whole of II.
	II.	5,600	160	2,000	25,300	10,100	1,700	400	45,260	III + ⅛ IV.
	III.	19,600	200	6,400	61,600	15,300	5,500	600	109,200	⅔ IV. + ⅓ IV., except for Nalona, for which + ⅛ IV.
	IV.	40,000	2,000	15,000	140,000	40,000	20,000	4,000	261,000	
Total ...		66,000	2,436	23,750	231,150	67,599	27,750	5,240	423,925	
Oaks ...	I.	1,300	140	5,000	6,900	2,800	2,300	8,600	27,040	II. + ⅓ III.
	II.	4,000	600	13,000	30,000	7,000	5,000	30,000	89,600	⅓ III. + ¾ IV.
	III.	9,000	1,200	23,000	64,000	14,000	9,000	57,000	177,200	¼ IV. + ⅝ IV.
	IV.	20,000	5,000	50,000	120,000	20,000	24,000	120,000	359,000	
Total ...		34,300	6,940	91,000	220,900	43,800	40,300	215,600	652,840	
Broms ...	I.	500	...	2,000	1,200	600	2,000	2,900	9,200	II. + ⅓ III.
	II.	1,700	...	6,000	6,700	2,800	4,700	10,000	31,900	⅔ III. + ⅓ IV.
	III.	5,000	50	19,000	25,000	10,000	12,000	23,000	94,050	⅔ IV. + IV.
	IV.	10,000	200	40,000	60,000	18,000	20,000	40,000	188,200	
Total ...		17,200	250	67,000	92,900	31,400	38,700	75,900	323,350	
Ayár ...	I.	30	...	100	50	30	120	120	450	II.
	II.	400	...	900	700	300	800	1,200	4,300	III.
	III.	2,600	10	5,500	7,000	3,600	3,600	9,500	31,810	IV. + ⅛ IV.
	IV.	8,000	30	11,000	15,000	7,000	8,000	20,000	69,030	
Total ...		11,030	40	17,500	22,750	10,930	12,520	30,820	105,590	
Sál ...	I.	200	40	...	...	...	...	...	240	II.
	II.	1,600	97	...	...	...	...	...	1,697	III
	III.	6,700	410	...	...	...	...	...	7,110	IV.
	IV.	14,000	1,000	...	...	...	...	...	15,000	
Total ...		22,500	1,547	...	...	...	...	...	24,047	
Sain ...	I.	100	10	...	1	4	...	...	115	II.
	II.	700	150	...	7	39	...	...	896	III.
	III.	2,200	250	...	15	133	...	...	2,598	IV.
	IV.	5,000	600	...	50	200	...	...	5,850	
Total ...		8,000	1,010	...	73	376	...	...	9,459	
GRAND TOTAL		159,030	12,223	199,250	567,773	154,105	119,270	327,560	1,539,211	

Species.	Girth-class.	Number of trees: In stock at beginning of period.	Exploitable during period.	To be given standing to right-holders and others.	Balance disposable.	Details of disposable balance: Number of trees utilizable for: Timber.	Firewood only.	Cubic feet of timber.	Maunds of firewood.
		And the quantity of exploitable materia will then be—							
Chír ...	I.	8,465	8,465	1,300	7,165	4,300	2,865	430,000	415,525
	II.	45,260	9,000	400	8,600	5,000	3,600	300,000	312,200
	III.	109,200	33,000	1,500	31,500	14,000	17,500	280,000	535,500
	IV.	261,000	100,000	4,000	96,000	...	96,000	...	672,000
Total ...		423,925	150,465	7,200	143,265	23,300	119,965	1,010,000	1,935,225
Oaks ...	I.	27,040	27,040	...	27,040	...	27,040	...	2,433,600
	II.	89,600	40,000	...	40,000	...	40,000	...	1,600,000
	III.	177,200	50,000	...	50,000	...	50,000	...	750,000
	IV.	359,000	140,000	...	140,000	...	140,000	...	560,000
Total ...		652,840	257,040	...	257,040	...	257,040	...	5,343,600
Brons ...	I.	9,200	9,200	...	9,200	...	9,200	...	322,000
	II.	31,900	15,000	...	15,000	...	15,000	...	270,000
	III.	94,050	30,000	...	30,000	...	30,000	...	180,000
	IV.	188,200	70,000	...	70,000	...	70,000	...	105,000
Total ...		323,350	124,200	...	124,200	...	124,200	...	877,000
Ayár ...	I.	450	450	...	450	...	450	...	15,750
	II.	4,300	4,300	...	4,300	...	4,300	...	77,400
	III.	31,800	10,000	...	10,000	...	10,000	...	60,000
	IV.	69,030	30,000	...	30,000	...	30,000	...	45,000
Total ...		105,590	44,750	...	44,750	...	44,750	...	198,150
Sál ...	I.	240	240	...	240	160	80	8,000	4,000
	II.	1,697	500	...	500	380	120	11,400	2,400
	III.	7,110	3,000	...	3,000	2,060	940	20,600	7,520
	IV.	15,000	7,000	...	7,000	3,000	4,000	6,000	16,000
Total ...		24,047	10,740	...	10,740	5,600	5,140	46,000	29,920
Sain ...	I.	115	115	...	115	70	45	3,500	2,475
	II.	896	300	...	300	160	140	4,800	2,800
	III.	2,598	1,000	...	1,000	400	600	3,200	6,000
	IV.	5,850	2,500	...	2,500	...	2,500	...	15,000
Total ...		9,459	3,915	...	3,915	630	3,285	11,500	26,275
Grand Total		1,539,211	591,110	7,200	583,910	29,530	554,380	1,067,500	8,410,170

In the preceding statement the figures in column 4 bear roughly the following respective proportions to those in column 3 :—for class I, 100 per cent. ; for class II, 20 per cent.; for class III, 30 per cent; for class IV, 45 per cent.

The proposed Reserve.

The forecast for this area can be made only for chír in the areas in which that species was surveyed. But as chír is rare or generally very scattered elsewhere, this forecast may be considered as applicable to the entire forest so far as that one species alone is concerned.

The number of counted chír trees to be spared out of the present stock is shown in the statement below :—

Girth-class.	Compartments.							
	B-D.	E.	F.	G-J.	K-P.	Q-R.	S.	Total.
II	389	112	90	1,066	3,377	719	190	5,943
III	832	153	141	1,337	5,684	534	305	8,990
IV	8,114	342	386	1,529	11,350	510	1,505	23,736
Total ...	9,335	607	617	3,932	20,411	1,763	2,004	38,669

Hence the stock of chír at the end of the 60 years will be approximately thus :—

Girth-class.	Number of trees in								How estimated from preceding statement.
	B-D.	E.	F.	G-J.	K-P.	Q-R.	S.	Total.	
I	389	112	90	1,066	3,377	719	190	5,943	II.
II	2,184	210	205	1,592	7,576	619	560	12,946	III. + ⅓IV.
III	12,000	510	580	2,290	17,000	760	2,200	35,340	⅓IV. + ⅓IV.
IV	20,000	1,500	2,000	6,000	40,000	3,000	4,000	76,500	
Total ...	34,573	2,332	2,875	10,948	67,953	5,098	6,950	130,729	

And the quantity of exploitable chír will be :—

Girth-class.	Number of trees				Details of disposable balance.			
	In stock at beginning of period.	Exploitable during period.	To be given standing to right-holders.	Balance disposable.	Number of trees utilizable for		Cubic feet of timber.	Maunds of firewood.
					Timber.	Firewood only.		
I ...	5,943	5,943	2,000	3,943	2,000	1,943	200,000	77,720
II ...	12,946	2,600	1,000	1,600	700	900	42,000	22,500
III ...	35,340	11,000	3,000	8,000	3,000	5,000	60,000	60,000
IV ...	76,500	30,000	6,000	24,000	...	24,000	...	168,000
Total ...	130,729	49,543	12,000	37,543	5,700	31,843	302,000	328,220

General Remarks.

The best justification that can be offered for the provisions of the present working plan is to invite a comparison between the figures on this and on the preceding page with those on pages 189, 191, and 192. With a vastly improved future, the forests, in spite of their present exhausted condition, will be able to yield, after satisfying right-holders, three times the quantity of timber and twice the quantity of fuel they are now able to furnish. To this we must add the immensely improved financial position as shown in the next chapter.

CHAPTER VIII.—FINANCIAL FORECAST.

The figures which follow can lay no claim to prefect accuracy. The forests are now, under the provisions of the present working plan, to be subjected to a sudden and complete change of some of the most essential conditions that have hitherto guided their working. Hence we can, under the circumstances, only attempt a rough, but for the purposes of the working plan a sufficiently approximate, estimate of the financial position it will lead up to. Care has been taken, in all doubtful cases, to remain well under the figures which will probably be actually attained. Quantities and rates have been taken from the data given in Part I, and, in order to simplify calculations, only net rates have been employed. It has been taken for granted that Government will permit an enhancement of the present absurdly low value of the monthly brass ticket, and its covering the removal of fodder grass in addition to that of dead and fallen firewood.

Annual Revenue.

	Rs.
20,000 cubic feet scantlings at 6 annas	7,500
26,000 maunds firewood supplied to troops at 1½ annas	2,500
4,000 monthly brass tickets for firewood and fodder at Re. 1	4,000
Royalty on 20,000 maunds charcoal at 4 annas	5,000
5,000 maunds firewood for lime-burning at 10 maunds per Re. 1	500
Grazing dues	300
Miscellaneous items	1,200
Total	21,000

Annual Expenditure.

Share of expenditure under head B, including direction charges	10,000
Fire conservancy	1,000
Planting and other improvements	2,000
Sundries	1,000
Total	14,000
Hence annual net revenue	7,000

This last figure is by no means large, but it is a distinct advance on the present annual deficit of Rs. 7,000 more or less, and in order to be at once more than doubled needs only a practical enforcement of the ruling laid down by the Supreme Government that the Forest Department shall base all its transctions on strictly business principles.

CHAPTER IX.—PROPOSED SCRUTINY AND REVISION OF WORKING PLAN AT CLOSE OF FIRST 10-YEAR SUB-PERIOD.

However carefully a working plan may be devised, the course of work under its provisions will always bring out certain points in which its anticipations will not be completely realized. This will be especially the case in our Indian forests, particularly in one which, like Naini Tal, will be worked up to its full capability for the first time.

Hence data should be collected during the currency of the 10-year sub-period in order to enable the plan to be revised at the close of that interval on a more certain basis than it has been possible to frame it on the present occasion. These data, besides furnishing a check on the facts and figures now given, should also include an account of the condition of the forest as affected by the carrying out of the proposals.

Only the principal points regarding which information should be sought and which would usually not be exhibited in the forms prescribed by the Departmental Code can be here suggested. They are :—

(1) Careful measurement and weighing every year of 10 average trees of each of the following five girth-classes for each of the more important species :—

I.—Above 6 feet.
II.— „ 4′ 6″ and up to 6′.
III.— „ 3′ „ 4′ 6″.
IV.— „ 1′ 6″ „ 3′.
V.— „ 9′ „ 1′ 6″.

The proportion (1) timber in the round and (2) sawn timber should also be ascertained for each tree fit for sawing. It is necessary to introduce the fifth girth-class in view of the yield of thinnings in young crops : at present this can only be estimated. The measurements and the computation of cubical contents should be effected on the plan adopted in this report.

(2) It is probable that the systematic work now to be undertaken will result in the more rapid growth of the trees. If this occurs, then the length of the period will have to be reduced from 60 years to some lower figure, the result being an increase more or less marked of the annual yield. This is a point of such immense importance that every year the rings on 10 stumps of average growth belonging to chír, sál, oaks, brons, and any other largely represented trees should be counted in the manner shown on page 30. As chír and sál form numerous spurious rings, two 1-acre sample plots—one near Charta, the other at Hinnan for chír, and near Kasáni and Mangoli respectively for sál—should be selected and measurements made at least once every five years, thinnings being effected whenever necessary. The produce of these thinnings should be carefully measured up and recorded.

(3) Checking of the descriptions of the compartments as they come under working and noting of necessary corrections.

(4) Careful noting and recording of results of the coppice improvement fellings suggested.

(5) Attentive study of the conditions under which natural regeneration from seed of the various important species takes place.

(6) Watching and measurement of marked self-sown seedlings in different kinds of soil and on different aspects, in order to study their progress until they reach the lowest or fifth girth-class. The seedlings chosen should be such as have just come up from the seed, in order that there may be no room for doubt regarding their age.

These various experiments require considerable labour and time, but that should be no drawback at Naini Tal, where all the forest officers of the circle recess during the summer and enjoy an appreciable amount of leisure. Assisted by his brother officers of the circle, the Divisional Officer should have no difficulty in carrying out all the preceding suggestions.

With such data at his disposal as it is now suggested to collect, the revising officer will have an easy task before him and will be able to frame his proposals for future work under the happiest conditions possible.

E. E. FERNANDEZ,
Offg. Deputy Director, Forest School.

APPENDIX I.

Computation of cubical contents of first class chir trees and of factors for reducing contents by the commercial method to true contents.

Number of type tree.	Part of tree.	Whether timber or firewood.	Running number of log or group of billets of the same girth.	Mean girth of log or billets in inches.	Area of section in square feet.	Length in feet of log or aggregate length of billets of the same girth.	Contents per log or group of billets of the same girth.	Total contents.	Remarks.
1	Trunk ...	Timber ...	1	109	6·566	10	65·66	352·06	Total height of tree = 105 feet. Girth at breast-height = 9 feet 5 inches. Contents of tree by square of ¼ girth × height = 581 cubic feet. Actual contents of— Timber = 352 cubic feet. Firewood = 84 " Entire tree = 436 " Hence reducing-factor for— Timber = 0·606 Firewood = 0·144 Entire tree = 0·750
			2	100	5·526	10	55·26		
			3	92½	4·728	10	47·28		
			4	86½	4·135	10	41·35		
			5	79½	3·493	10	34·93		
			6	73½	2·986	10	29·86		
			7	69	2·631	10	26·31		
			8	63	2·193	10	21·93		
			9	55½	1·701	10	17·01		
			10	47½	1·247	10	12·47		
		Firewood,	11	36	0·716	5	35·80	84·09	
	Branches ...	Firewood,	1	42	0·975	14	13·65		
			2	27	0·403	5	2·01		
			3	26	0·374	9	3·37		
			4	24	0·318	15	4·77		
			5	22	0·267	24	6·41		
			6	21	0·244	9	2·20		
			7	20	0·221	15	3·31		
			8	18	0·179	14	2·51		
			9	17	0·160	8	1·28		
			10	16	0·141	33	4·65		
			11	15	0·124	4	0·49		
			12	14	0·108	12	1·30		
			13	13	0·093	5	0·46		
			14	12	0·079	14	1·11		
			15	11	0·067	5	0·33		
			16	10	0·055	8	0·44		
2	Trunk ...	Timber ...	1	80½	3·581	10	35·81	174·69	Total height of tree = 109 feet. Girth at breast-height = 7 feet 1 inch. Contents of tree by square of ¼ girth × height = 342 cubic feet. Actual contents of— Timber = 175 cubic feet. Firewood = 29 " Entire tree = 204 " Hence reducing factor for— Timber = 0·512. Firewood = 0·085. Entire tree = 0·597.
			2	73½	2·986	10	29·86		
			3	70	2·708	10	27·08		
			4	69	2·631	10	26·31		
			5	64½	2·299	10	22·99		
			6	57½	1·827	10	18·27		
			7	51	1·437	10	14·37		
		Firewood,	8	39	0·841	10	8·41		
			9	24	0·318	10	3·18		
			10	12½	0·086	10	0·86		
			11	4	0·009	5	0·04		
	Branches ...	Firewood,	1	17	0·160	12	1·92	29·29	
			2	16	0·141	53	7·47		
			3	15	0·124	5	0·62		
			4	14	0·108	18	1·94		
			5	13	0·093	22	2·05		
			6	12	0·079	14	1·11		
			7	10	0·055	8	0·44		
			8	9	0·045	19	0·85		
			9	8	0·036	11	0·40		
3	Trunk ...	Timber ...	1	80	3·537	10	35·37	191·61	Total height of tree = 105 feet. Girth at breast-height = 6 feet 10 inches. Contents of tree by square of ¼ girth × height = 306 cubic feet. Actual contents of— Timber = 192 cubic feet. Firewood = 53 " Entire tree = 245 " Hence reducing factor for— Timber = 0·627. Firewood = 0·173. Entire tree = 0·800.
			2	76	3·192	10	31·92		
			3	72	2·865	10	28·65		
			4	68	2·555	10	25·55		
			5	64	2·263	10	22·63		
			6	61	2·056	10	20·56		
			7	56½	1·764	10	17·64		
			8	41	0·929	10	9·29		
		Firewood,	9	25½	0·359	10	3·59		
	Branches ...	Firewood,	1	29	0·465	10	4·65	52·77	
			2	26	0·374	9	3·37		
			3	25	0·345	9	3·10		
			4	21	0·244	66	16·10		
			5	20	0·221	21	4·64		
			6	18	0·179	18	3·22		
			7	17	0·160	30	4·80		
			8	16	0·141	6	0·85		
			9	15	0·124	12	1·49		
			10	13	0·093	20	1·86		
			11	12	0·079	21	1·66		
			12	11	0·067	9	0·60		
			13	10	0·055	27	1·48		
			14	9	0·045	13	0·58		
			15	8	0·036	4	0·14		
			16	7	0·027	15	0·40		
			17	6	0·020	12	0·24		

APPENDIX I.—(*continued*).

Computation of cubical contents of first class chir trees and of factors for reducing contents by the commercial method to true contents.

Number of type tree.	Part of tree.	Whether timber or firewood.	Running number of log or group of billets of the same girth.	Mean girth of log or billet in inches.	Area of section in square feet.	Length in feet of log or aggregate length of billets of the same girth.	Contents per log or group of billets of the same girth.	Total contents.	Remarks.
4	Trunk ...	Timber ...	1	80	3·537	10	35·37	186·01	Total height of tree = 98 feet. Girth at breast height = 6 feet 10 inches. Contents of tree by square of ¼ girth × height × 286 cubic feet. Actual contents of— Timber = 186 cubic feet. Firewood = 52 " Entire tree = 238 " Hence reducing factor for— Timber = 0·650. Firewood = 0·182. Entire tree = 0·832.
			2	75½	3·150	10	31·50		
			3	71½	2·825	10	28·25		
			4	69	2·631	10	26·31		
			5	68½	2·593	10	25·93		
			6	65½	2·371	10	23·71		
			7	52	1·494	10	14·94		
	Branches ...	Firewood,	1	26	0·374	10	3·74	51·64	
			2	24	0·318	18	5·72		
			3	22	0·267	23	6·14		
			4	21	0·244	2	0·49		
			5	20	0·221	25	5·52		
			6	19	0·199	21	4·18		
			7	18	0·179	9	1·61		
			8	17	0·160	28	4·48		
			9	16	0·141	10	1·41		
			10	15	0·124	18	2·23		
			11	14	0·108	53	5·72		
			12	13	0·093	12	1·12		
			13	12	0·079	38	3·00		
			14	11	0·067	16	1·07		
			15	10	0·055	32	1·76		
			16	9	0·045	32	1·44		
			17	8	0·036	39	1·40		
			18	7	0·027	10	0·27		
			19	6	0·020	7	0·14		
			20	5	0·014	14	0·20		
5	Trunk ...	Timber ...	1	77	3·276	10	32·76	178·85	Total height of tree = 97 feet. Girth at breast-height = 6 feet. 8 inches. Contents of tree by square of ¼ girth × height = 269 cubic feet. Actual contents of— Timber = 179 cubic feet. Firewood = 25 " Entire tree = 204 " Hence reducing factor for— Timber = 0·665 Firewood = 0·093 Entire tree = 0·758
			2	73	2·945	10	29·45		
			3	69½	2·669	10	26·69		
			4	65	2·335	10	23·35		
			5	62½	2·159	10	21·59		
			6	59½	1·956	10	19·56		
			7	52½	1·523	10	15·23		
			8	43	1·022	10	10·22		
	Branches ...	Firewood ...	1	36	0·716	6	4·30	25·04	
			2	29	0·465	4	1·86		
			3	21	0·244	13	3·17		
			4	19	0·199	4	0·80		
			5	18	0·179	3	0·54		
			6	17	0·160	12	1·92		
			7	16	0·141	25	3·52		
			8	15	0·124	17	2·11		
			9	13	0·093	27	2·51		
			10	12	0·079	25	1·97		
			11	11	0·067	1	0·07		
			12	10	0·055	8	0·44		
			13	9	0·045	8	0·36		
			14	8	0·036	13	0·47		
			15	7	0·027	12	0·32		
			16	6	0·020	34	0·68		
6	Trunk ...	Timber ...	1	67½	2·518	10	25·18	112·06	Total height of tree = 98 feet. Girth at breast-height = 6 feet 8 inches. Contents of tree by square of ¼ girth × height = 271 cubic feet. Actual contents of— Timber = 112 cubic feet. Firewood = 34 " Entire tree = 146 " Hence reducing factor for— Timber = 0·413 Firewood = 0·125 Entire tree = 0·538
			2	64	2·263	10	22·63		
			3	60	1·989	10	19·89		
			4	55	1·672	10	16·72		
			5	50½	1·410	10	14·10		
			6	49½	1·354	10	13·54		
		Firewood ...	7	36	0·716	10	7·16	33·96	
			8	27½	0·418	10	4·18		
			9	21	0·244	10	2·44		
	Branches ...	Firewood	1	16	0·141	4	0·56		
			2	15	0·124	43	5·33		
			3	14	0·108	13	1·40		
			4	13	0·093	20	1·86		
			5	12	0·079	48	3·79		
			6	11	0·067	29	1·94		
			7	10	0·055	39	2·14		
			8	9	0·045	17	0·76		
			9	8	0·036	45	1·62		
			10	7	0·027	23	0·62		
			11	6	0·020	8	0·16		

APPENDIX I—(*continued*).

Computation of cubical contents of first class chir trees and of factors for reducing contents by the commercial method to true contents.

Number of type tree.	Part of tree.	Whether timber or firewood.	Running number of log or group of billets of the same girth.	Mean girth of log or billet in inches.	Area of section in square feet.	Length in feet of log or aggregate length of billets of the same girth.	Contents per log or group of billets of the same girth.	Total contents.	Remarks.
7	Trunk ...	Timber ...	1	66½	2·444	10	24·44	103·70	Total height of tree = 84 feet. Girth at breast-height = 6 feet 8 inches. Contents of tree by square of ¼ girth × height = 233 cubic feet. Actual contents of— Timber = 104 cubic feet. Firewood = 28 „ Entire tree = 132 „ Hence reducing factor for— Timber = 0·446 Firewood = 0·120 Entire tree = 0·566
			2	61½	2·090	10	20·90		
			3	57½	1·827	10	18·27		
			4	53½	1·582	10	15·82		
			5	50	1·382	10	13·82		
			6	43½	1·045	10	10·45		
		Firewood ...	7	32½	0·584	10	5·84		
	Branches ...	Firewood...	1	24	0·318	2	0·64	28·39	
			2	20	0·221	7	1·55		
			3	19	0·199	3	0·60		
			4	16	0·141	8	1·13		
			5	15	0·124	29	3·60		
			6	14	0·108	36	3·89		
			7	13	0·093	22	2·05		
			8	12	0·079	21	1·67		
			9	11	0·067	28	1·88		
			10	10	0·055	46	2·53		
			11	9	0·045	32	1·44		
			12	7	0·027	38	1·03		
			13	6	0·020	22	0·44		
			14	5	0·014	7	0·10		
8	Trunk ...	Timber ...	1	75	3·108	10	31·08	178·76	Total height of tree 104 feet. Girth at breast-height = 6 feet 4 inches. Contents of tree by square of ¼ girth × height = 261 cubic feet. Actual contents of— Timber = 179 cubic feet. Firewood = 31 „ Entire tree = 210 „ Hence reducing factor for— Timber = 0·686 Firewood = 0·119 Entire tree = 0·805
			2	72½	2·905	10	21·05		
			3	70½	2·747	10	27·47		
			4	66	2·407	10	24·07		
			5	60½	2·023	10	20·23		
			6	58½	1·891	10	18·91		
			7	55½	1·701	10	17·01		
			8	44½	1·094	10	10·94		
		Firewood	9	30	0·497	10	4·97		
	Branches ...	Firewood...	1	38	0·798	14	11·17	31·57	
			2	22	0·267	10	2·67		
			3	21	0·244	10	2·14		
			4	20	0·221	5	1·10		
			5	19	0·199	12	2·39		
			6	17	0·160	14	2·24		
			7	16	0·141	6	0·85		
			8	15	0·124	10	1·24		
			9	14	0·108	4	0·43		
			10	12	0·079	20	1·58		
			11	10	0·052	4	0·22		
			12	9	0·045	6	0·27		
9	Trunk ...	Timber ...	1	74	3·026	10	30·26	142·67	Total height of tree = 102 feet. Girth at breast-height = 6 feet 4 inches. Contents of tree by square of ¼ girth × height = 256 cubic feet. Actual contents of— Timber = 143 cubic feet. Firewood = 23 „ Entire tree = 166 „ Hence reducing factor for— Timber = 0·559 Firewood = 0·090 Entire tree = 0·649
			2	69	2·631	10	26·31		
			3	65½	2·371	10	23·70		
			4	62	2·124	10	21·24		
			5	56½	1·764	10	17·64		
			6	49½	1·354	10	13·54		
			7	42½	0·998	10	9·98		
		Firewood...	8	29	0·465	10	4·65		
			9	14½	0·116	10	1·16		
			10	5	0·014	8	0·11		
	Branches ...	Firewood...	1	21	0·244	3	0·73	23·03	
			2	17	0·160	6	0·96		
			3	16	0·141	8	1·13		
			4	15	0·124	23	2·85		
			5	14	0·108	30	3·24		
			6	13	0·093	51	4·74		
			7	12	0·079	33	2·61		
			8	10	0·055	13	0·71		
			9	8	0·036	4	0·14		

APPENDIX I.—(*continued*).

Computation of cubical contents of first class chir trees and of factors for reducing contents by the commercial method to true contents.

Number of type tree.	Part of tree.	Whether timber or firewood.	Running number of log or group of billets of the same girth.	Mean girth of log or billet in inches.	Area of section in square feet.	Length in feet of log or aggregate length of billets of the same girth.	Contents per log or group of billets of the same girth.	Total contents.	Remarks.
10	Trunk ...	Timber ...	1	68½	2·593	10	25·93	111·99	Total height of tree = 100 feet. Girth at breast-height = 6 feet 4 inches. Contents of tree by square of ¼ girth × height = 250 cubic feet. Actual contents of— Timber = 112 cubic feet. Firewood = 23 „ Entire tree = 135 „ Hence reducing factor for— Timber = 0·448 Firewood = 0·092 Entire tree = 0·540
			2	59	1·924	10	19·24		
			3	55½	1·701	10	17·01		
			4	52	1·494	10	14·94		
			5	48	1·273	10	12·73		
			6	46	1·169	10	11·69		
			7	43½	1·045	10	10·45		
		Firewood,	8	33½	0·620	10	6·20	22·78	
			9	24	0·318	10	3·18		
			10	11	0·067	6	0·40		
	Branches ...	Firewood,	1	18	0·179	34	6·09		
			2	16	0·141	7	0·99		
			3	15	0·124	17	2·11		
			4	14	0·108	12	1·30		
			5	13	0·093	13	1·21		
			6	12	0·079	6	0·47		
			7	11	0·067	7	0·47		
			8	8	0·036	10	0·36		
11	Trunk ...	Timber ..	1	74	3·026	10	30·26	138·17	Total height of tree = 104 feet. Girth at breast-height = 6 feet 3 inches. Contents of tree by square of ¼ girth × height = 254 cubic feet. Actual contents of— Timber = 138 cubic feet. Firewood = 79 „ Entire tree = 217 „ Hence reducing factor for— Timber = 0·543 Firewood = 0·311 Entire tree = 0·854
			2	71½	2·825	10	28·25		
			3	68½	2·593	10	25·93		
			4	64½	2·299	10	22·99		
			5	57½	1·827	10	18·27		
			6	47½	1·247	10	12·47		
		Firewood,	7	38	0·798	10	7·98	78·57	
			8	26½	0·388	10	3·88		
			9	12½	0·086	10	0·86		
	Branches ...	Firewood,	1	32	0·566	24	13·58		
			2	21	0·244	8	1·95		
			3	20	0·221	40	8·84		
			4	19	0·199	23	4·58		
			5	18	0·179	36	6·44		
			6	17	0·160	19	3·04		
			7	16	0·141	14	1·97		
			8	15	0·124	63	7·81		
			9	14	0·108	39	4·21		
			10	13	0·093	87	8·09		
			11	12	0·079	35	2·76		
			12	10	0·055	20	1·10		
			13	9	0·045	13	0·58		
			14	8	0·036	18	0·46		
			15	7	0·027	15	0·40		
			16	5	0·014	3	0·04		
12	Trunk ...	Timber ...	1	72	2·865	10	28·65	125·90	Total height of tree = 86 feet. Girth at breast-height = 6 feet 1 inch Contents of tree by square of ¼ girth × height = 199 cubic feet. Actual contents of— Timber = 126 cubic feet. Firewood = 43 „ Entire tree = 169 „ Hence reducing factor for— Timber = 0·633 Firewood = 0·216 Entire tree = 0·849
			2	69½	2·669	10	26·69		
			3	65½	2·371	10	23·71		
			4	60	1·989	10	19·89		
			5	53	1·552	10	15·52		
			6	45½	1·144	10	11·44		
		Firewood,	7	34	0·639	10	6·39	43·51	
			8	18	0·179	10	1·79		
	Branches ...	Firewood,	1	17	0·160	43	6·88		
			2	16	0·141	39	5·50		
			3	15	0·124	40	4·96		
			4	14	0·108	24	2·59		
			5	13	0·093	48	4·46		
			6	12	0·079	65	5·13		
			7	11	1·067	31	2·08		
			8	10	0·055	6	0·33		
			9	9	0·045	31	1·39		
			10	8	0·036	30	1·08		
			11	7	0·027	18	0·49		
			12	6	0·020	22	0·44		

APPENDIX I.—(*continued*).

Computation of cubical contents of first class chir trees and of factors for reducing contents by the commercial method to true contents.

Number of type tree.	Part of tree.	Whether timber or firewood.	Running number of log or group of billets of the same girth.	Mean girth of log or billet in inches.	Area of section in square feet.	Length in feet of log or aggregate length of billets of the same girth.	Contents per log or group of billets of the same girth.	Total contents.	Remarks.
13	Trunk ...	Timber ...	1	69	2·631	10	26·31	127·61	Total height of tree = 99 feet. Girth at breast-height = 6 feet 1 inch. Contents of tree by square of ¼ girth × height = 225 cubic feet. Actual contents of— Timber = 128 cubic feet. Firewood = 32 " Entire tree = 160 " Hence reducing factor for— Timber = 0·569 Firewood = 0·142 Entire tree = 0·711
			2	64	2·263	10	22·63		
			3	60½	2·023	10	20·23		
			4	57	1·795	10	17·95		
			5	54½	1·641	10	16·41		
			6	50½	1·410	10	14·10		
			7	42½	0·998	10	9·98		
		Firewood,	8	34½	0·658	10	6·58		
			9	24	0·318	10	3·18		
			10	14	0·108	3	0·32		
	Branches ...	Firewood,	1	19	0·199	5	0·99	32·07	
			2	17	0·160	3	0·48		
			3	16	0·141	6	0·85		
			4	14	0·108	33	3·56		
			5	12	0·079	50	3·95		
			6	11	0·067	45	3·01		
			7	10	0·055	71	3·90		
			8	9	0·045	36	1·62		
			9	8	0·036	68	2·27		
			10	7	0·027	19	0·51		
			11	6	0·020	34	0·68		
			12	5	0·014	12	0·17		
14	Trunk ...	Timber ...	1	72	2·865	10	28·65	125·96	Total height of tree = 83 feet. Girth at breast-height = 6 feet 1 inch. Contents of tree by square of ¼ girth × height = 192 cubic feet. Actual contents of— Timber = 126 cubic feet. Firewood = 29 " Entire tree = 155 " Hence reducing factor for— Timber = 0·656 Firewood = 0·151 Entire tree = 0·807
			2	70	2·708	10	27·08		
			3	66	2·407	10	24·07		
			4	60	1·989	10	19·89		
			5	53½	1·582	10	15·82		
			6	43½	1·045	10	10·45		
		Firewood ...	7	28	0·433	10	4·33		
	Branches ...	Firewood,	1	21	0·244	6	1·46	29·35	
			2	19	0·199	17	3·38		
			3	18	0·179	5	0·89		
			4	17	0·160	15	2·40		
			5	16	0·141	11	1·55		
			6	15	0·124	26	3·22		
			7	14	0·108	15	1·62		
			8	13	0·093	62	5·77		
			9	12	0·079	18	1·38		
			10	10	0·055	30	1·65		
			11	9	0·045	28	1·26		
			12	7	0·027	13	0·35		
			13	5	0·014	7	0·09		
15	Trunk ...	Timber ...	1	71	2·786	10	27·86	135·67	Total height of tree = 94 feet. Girth at breast-height = 6 feet. Contents of tree by square of ¼ girth × height = 211 cubic feet. Actual contents of— Timber = 136 cubic feet. Firewood = 22 " Entire tree = 158 " Hence reducing factor for— Timber = 0·645 Firewood = 0·104 Entire tree = 0·749
			2	68	2·555	10	25·55		
			3	62½	2·159	10	21·59		
			4	59	1·924	10	19·24		
			5	55	1·672	10	16·72		
			6	49	1·327	10	13·27		
			7	45½	1·144	10	11·44		
		Firewood,	8	40½	0·906	10	9·06		
			9	28½	0·449	10	4·49		
	Branches ...	Firewood,	1	16	0·141	5	0·70	21·56	
			2	15	0·124	11	1·36		
			3	14	0·108	5	0·54		
			4	13	0·093	32	2·98		
			5	12	0·079	17	1·34		
			6	11	0·067	10	0·67		
			7	10	0·055	6	0·33		
			8	9	9·045	2	0·09		

APPENDIX I.—(*concluded*).

Computation of cubical contents of first class chir trees and of factors for reducing contents by the commercial method to true contents.

Number of type tree.	Part of tree.	Whether timber or firewood.	Running number of log or group of billets of the same girth.	Mean girth of log or billet in inches.	Area of section in square feet.	Length in feet of log or aggregate length of billets of the same girth.	Contents per log or group of billets of the same girth.	Total contents.	Remarks.
16	Trunk ...	Timber...	1	71	2·786	10	27·86	134·91	Total height of tree = 88 feet. Girth at breast-height = 6 feet. Contents of tree by square of ¼ girth × height = 198 cubic feet. Actual contents of— Timber = 135 cubic feet. Firewood = 22 " Entire tree = 157 " Hence reducing factor for— Timber = 0·682 Firewood = 0·111 Entire tree = 0·793
			2	70½	2·747	10	27·47		
			3	65½	2·371	10	23·71		
			4	58½	1·891	10	18·91		
			5	52½	1·523	10	15·23		
			6	47	1·221	10	12·21		
			7	41½	0·952	10	9·52		
		Firewood ..	8	29½	0·481	8	3·85		
	Branches,	Firewood,	1	24	0·318	12	3·82	21·85	
			2	21	0·244	5	2·22		
			3	18	0·179	21	3·76		
			4	13	0·093	20	1·86		
			5	11	0·067	48	3·22		
			6	10	0·055	22	1·11		
			7	9	0·045	27	1·21		
			8	8	0·036	16	0·58		
			9	7	0·027	8	0·22		

APPENDIX II.

Computation of cubical contents of second class chir trees and of factors for reducing contents by the commercial method to true contents.

Number of type tree.	Part of tree.	Whether timber or firewood.	Running number of log or group of billets of the same girth.	Mean girth of log or billet in inches.	Area of section in square feet.	Length in feet of log or aggregate length of billets of the same girth.	Contents per log or group of billets of the same girth.	Total contents.	Remarks.
1	Trunk ...	Timber ...	1	68½	2·593	10	25·93	139·09	Total height of tree = 109 feet. Girth at breast-height = 5 feet 11 inches. Contents of tree by square of quarter girth × height = 238 cubic feet.
			2	65	2·335	10	23·35		
			3	63	2·193	10	21·93		
			4	60½	2·023	10	20·23		
			5	57½	1·827	10	18·27		
			6	54	1·611	10	16·11		
			7	49	1·327	10	13·27		
		Firewood,	8	42	0·975	10	9·75	36·98	Actual contents of— Timber = 139 cubic feet. Firewood = 37 ,, Entire tree = 176 ,, Hence reducing factor for— Timber = 0·584 Firewood = 0·156 Entire tree = 0·740
			9	32	0·566	10	5·66		
			10	20	0·221	10	2·21		
			11	7	0·027	5	0·13		
	Branches ...	Firewood,	1	17	0·160	12	1·92		
			2	16	0·141	5	0·70		
			3	15	0·124	21	2·60		
			4	14	0·108	24	2·59		
			5	13	0·093	18	1·67		
			6	12	0·079	39	3·08		
			7	11	0·067	39	1·61		
			8	10	0·055	14	2·61		
			9	9	0·045	34	1·53		
			10	8	0·036	16	0·74		
			11	6	0·020	9	0·18		
2	Trunk ...	Timber ...	1	68	2·555	10	25·55	110·47	Total height of tree = 92 feet. Girth at breast-height = 5 feet 10 inches. Contents of tree by square of quarter girth × height = 196 cubic feet. Actual contents of— Timber = 110 cubic feet. Firewood = 45 ,, Entire tree = 155 ,, Hence reducing factor for— Timber = 0·561 Firewood = 0·229 Entire tree = 0·790
			2	64½	2·299	10	22·99		
			3	60½	2·023	10	20·23		
			4	57½	1·827	10	18·27		
			5	51	1·437	10	14·37		
			6	40½	0·906	10	9·06		
		Firewood ...	7	33½	0·620	10	6·20		
	Branches ...	Firewood,	8	25½	0·359	10	3·59	45·02	
			1	18	0·179	21	3·76		
			2	16	0·141	25	3·52		
			3	15	0·124	71	8·80		
			4	14	0·108	39	4·21		
			5	13	0·093	52	4·84		
			6	12	0·079	40	3·16		
			7	11	0·067	8	0·54		
			8	10	0·055	54	2·97		
			9	9	0·045	34	1·53		
			10	8	0·036	48	1·73		
			11	6	0·020	3	0·06		
			12	5	0·014	8	0·11		
3	Trunk ...	Timber ...	1	66½	2·444	10	24·44	119·62	Total height of tree = 98 feet. Girth at breast-height = 5 feet 10 inches. Contents of tree by square of ¼ girth × height = 210 cubic feet.
			2	61½	2·090	10	20·90		
			3	58½	1·891	10	18·91		
			4	55½	1·701	10	17·01		
			5	51½	1·466	10	14·66		
			6	48½	1·299	10	12·99		
			7	44	1·070	10	10·70		
		Firewood,	8	34½	0·658	10	6·58	28·85	Actual contents of timber = 120 cubic feet. Firewood = 29 cubic feet. Entire tree = 149 ,, Hence reducing factor for— Timber = 0·571 Firewood = 0·138 Entire tree = 0·709
			9	21½	0·255	10	2·55		
	Branches ...	Firewood,	1	22	0·267	11	2·94		
			2	21	0·244	13	3·17		
			3	19	0·199	8	1·59		
			4	18	0·179	10	1·79		
			5	16	0·141	10	1·41		
			6	15	0·124	14	1·74		
			7	14	0·108	7	0·76		
			8	13	0·093	6	0·56		
			9	12	0·079	40	3·16		
			10	10	0·055	21	1·15		
			11	9	0·045	16	0·72		
			12	8	0·036	14	0·50		
			13	7	0·027	5	0·13		
			14	6	0·020	5	0·10		

APPENDIX II—(*continued*).

Computation of cubical contents of second class chir trees and of factors for reducing contents by the commercial method to true contents.

Number of type tree.	Part of tree.	Whether timber or firewood.	Running number of log or group of billets of the same girth.	Mean girth of log or billet in inches.	Area of section in square feet.	Length in feet of log or aggregate length of billets of the same girth.	Contents per log or group of billets of the same girth.	Total contents.	Remarks.
4	Trunk ...	Timber ...	1	68	2·555	10	25·55	110·31	Total height of tree = 87 feet. Girth at breast-height = 5 feet 10 inches. Contents of tree by square of ¼ girth × height = 185 cubic feet.
			2	63	2·193	10	21·93		
			3	59	1·924	10	19·24		
			4	55½	1·701	10	17·01		
			5	51	1·437	10	14·37		
			6	47	1·221	10	12·21		
			7	33	0·602	10	6·02		
		Firewood	8	16	0·141	10	1·41		
	Branches ...	Firewood	1	20	0·221	16	3·54	38·80	Actual contents of— Timber = 110 cubic feet. Firewood = 39 " Entire tree = 149 " Hence reducing factor for— Timber = 0·595 Firewood = 0·210 Entire tree = 0·805
			2	17	0·160	28	4·48		
			3	16	0·141	9	1·27		
			4	15	0·124	38	4·71		
			5	14	0·108	26	2·81		
			6	12	0·079	104	8·22		
			7	10	0·055	60	3·30		
			8	9	0·045	23	1·03		
			9	8	0·036	53	1·91		
			10	6	0·020	5	0·10		
5	Trunk ...	Timber ...	1	67	2·481	10	24·81	123·74	Total height of tree = 97 feet. Girth at breast-height = 5 feet 9 inches. Contents of tree by square of ¼ girth × height = 200 cubic feet. Actual contents of— Timber = 124 cubic feet. Firewood = 24 " Entire tree = 148 " Hence reducing factor for— Timber = 0·620 Firewood = 0·120 Entire tree = 0·740
			2	64½	2·299	10	22·99		
			3	61	2·056	10	20·56		
			4	58	1·859	10	18·59		
			5	53	1·552	10	15·52		
			6	47	1·221	10	12·21		
			7	40½	0·906	10	9·06		
		Firewood	8	29½	0·485	10	4·85		
			9	18	0·179	10	1·79		
	Branches ...	Firewood	1	23	0·299	7	2·09	24·47	
			2	21	0·244	15	3·66		
			3	19	0·199	23	4·58		
			4	18	0·179	6	1·07		
			5	14	0·108	8	0·86		
			6	13	0·093	33	3·07		
			7	12	0·079	13	1·03		
			8	11	0·067	13	0·87		
			9	10	0·055	11	0·60		
6	Trunk ...	Timber ...	1	66	2·407	10	24·07	21·05	Total height of tree = 104 feet. Girth at breast-height = 5 feet 9 inches. Contents of tree by square of ¼ girth × height = 215 cubic feet. Actual contents of— Timber = 121 cubic feet. Firewood = 26 " Entire tree = 147 " Hence reducing factor for— Timber = 0·563 Firewood = 0·121 Entire tree = 0·684
			2	62	2 124	10	21·24		
			3	60	1·989	10	19·89		
			4	57	1·795	10	17·95		
			5	54	1·611	10	16·11		
			6	48	1·273	10	12·73		
			7	40½	0·906	10	9·06		
		Firewood	8	34½	0·658	10	6·58		
			9	26	0·374	10	3 74		
			10	14	0·108	10	1·08		
	Branches ...	Firewood	1	23	0·292	17	4·96	25·97	
			2	20	0·221	16	3·54		
			3	19	0·199	10	1·99		
			4	17	0·160	10	1·60		
			5	15	0·124	11	1·36		
			6	13	0 093	7	0·65		
			7	11	0 067	3	0·20		
			8	10	0·055	5	0·27		
7	Trunk ...	Timber ...	1	63½	2·228	10	22·28	107·60	Total height of tree = 01 feet. Girth at breast-height = 5 feet 8 inches. Contents of tree by square of ¼ girth × height = 183 cubic feet. Actual contents of— Timber = 108 cubic feet.
			2	58½	1·891	10	18 91		
			3	55½	1·701	10	17·01		
			4	52	1·494	10	14·94		
			5	49	1·327	10	13·27		
			6	45½	1·144	10	11·44		
			7	42	0·975	10	9·75		
		Firewood ...	8	35½	0·696	10	6·96		

APPENDIX II—(*continued*).

Computation of cubical contents of second class chir trees and of factors for reducing contents by the commercial method to true contents.

Number of type tree.	Part of tree.	Whether timber or firewood.	Running number of log or group of billets of the same girth.	Mean girth of log or billet in inches.	Area of section in square feet.	Length in feet of log or aggregate length of billets of the same girth.	Contents per log or group of billets of the same girth.	Total contents.	Remarks.
	Branches ...	Firewood,	1	29	0·465	8	3·72	20·02	Firewood = 20 cubic feet. Entire tree = 128 „ Hence reducing factor for— Timber = 0·590. Firewood = 0·109. Entire tree = 0·699.
			2	19	0·189	6	1·19		
			3	15	0·124	5	0·62		
			4	14	0·108	3	0·32		
			5	13	0·093	3	0·28		
			6	12	0·079	15	1·18		
			7	11	0· 67	22	1·47		
			8	10	0·055	22	1·21		
			9	9	0·045	19	0·85		
			10	8	0·036	20	0·72		
			11	7	0·027	29	0·78		
			12	6	0·020	29	0·58		
			13	5	0·014	10	0·14		
							C. ft.	C. ft.	
8	Trunk ...	Timber ..	1	65	2·335	10	23·35	84·73	Total height of tree = 75 feet. Girth at breast-height = 5 feet 8 inches. Contents of tree by square of ¼ girth × height = 151 cubic feet. Actual contents of— Timber = 85 cubic feet. Firewood = 25 „ Entire tree = 110 „ Hence reducing factor for— Timber = 0·563 Firewood = 0·166 Entire tree = 0·729
			2	60½	2·023	10	20·23		
			3	57½	1·827	10	18·27		
			4	50	1·382	10	13·82		
			5	40½	0·906	10	9·06		
		Firewood,	6	32	0·586	10	5·66		
			7	18½	0·189	10	1·89		
	Branches ...	Firewood,	1	17	0·160	19	3·04	25·30	
			2	15	0·124	11	1·36		
			3	14	0·108	4	0·43		
			4	13	0·093	18	1·67		
			5	12	0·079	51	4·03		
			6	11	0·067	13	0·87		
			7	10	0·055	53	2·91		
			8	9	0·045	29	1·30		
			9	8	0·036	19	0·18		
			10	7	0·027	34	0·92		
			11	6	0·020	27	0·54		
9	Trunk ...	Timber ...	1	64½	2·299	10	22·99	104·31	Total height of tree = 86 feet. Girth at breast-height = 5 feet 7 inches. Contents of tree by square of ¼ girth × height = 168 cubic feet. Actual contents of— Timber = 104 cubic feet. Firewood = 43 „ Entire tree = 147 „ Hence reducing factor for— Timber = 0·619. Firewood = 0·256. Entire tree = 0·875.
			2	60	1·989	10	19·89		
			3	57	1·795	10	17·95		
			4	55	1·672	10	16·72		
			5	53½	1·582	10	15·82		
			6	44½	1·094	10	10·94		
	Branches ...	Firewood,	1	40	0·884	4	3·54	42·85	
			2	32	0·566	5	2·83		
			3	31	0·531	26	13·71		
			4	26	0·374	16	5·98		
			5	22	0·267	6	1·60		
			6	21	0·244	20	4·88		
			7	16	0·141	9	1·27		
			8	1	0·124	11	1·36		
			9	14	0·108	17	1·84		
			10	13	0·093	10	0·93		
			11	12	0·079	27	2·13		
			12	10	0 055	19	1·04		
			13	9	0·045	23	1·03		
			14	8	0·036	3	0·11		
			15	7	0·027	11	0·30		
			16	6	0·020	14	0·28		
			17	5	0·014	2	0·02		
10	Trunk ...	Timber ...	1	65	2·335	10	23·35	93·42	Total height of tree = 92 feet. Girth breast-height = 5 feet 7 inches. Contents of tree by square of ¼ girth = height × 179 cubic feet. Actual contents of— Timber = 93 cubic feet. Firewood = 46 „ Entire tree = 139 „
			2	62	2·124	10	21·24		
			3	58½	1·891	10	18·91		
			4	53½	1·582	10	15·82		
			5	50½	1·410	10	14·10		
		Firewood,	6	40	0·884	10	8·84		
			7	28½	0·449	10	4·49		
			8	24½	0·332	10	3·32		

APPENDIX II—(*continued*).

Computation of cubical contents of second class chir trees and of factors for reducing contents by the commercial method to true contents.

Number of type tree.	Part of tree.	Whether timber or firewood.	Running number of log or group of billets of the same girth.	Mean girth of log or billet in inches.	Area of section in square feet.	Length in feet of log or aggregate length of billets of the same girth.	Contents per log or group of billets of the same girth.	Total contents.	Remarks.
	Branches ...	Firewood,	1	33	0·602	10	6·02	46·86	Hence reducing factor for— Timber = 0·519. Firewood = 0·257. Entire tree = 0·776.
			2	27	0·403	3	1·21		
			3	26	0·374	4	1·50		
			4	24	0·318	9	2·86		
			5	23	0·292	5	1·46		
			6	22	0·267	4	1·07		
			7	21	0·244	6	1·46		
			8	19	0·199	5	0·99		
			9	17	0·160	13	2·08		
			10	16	0·141	22	3·10		
			11	15	0·124	6	0·74		
			12	14	0·108	11	1·19		
			13	13	0·093	10	0·93		
			14	12	0·079	19	1·5		
			15	11	0·067	6	0·47		
			16	10	0·055	28	1·54		
			17	8	0·036	9	0·32		
			18	7	0·027	24	0·65		
			19	6	0·020	4	0·08		
			20	5	0·014	8	0·11		
11	Trunk ...	Timber ...	1	62½	2·159	10	21·59	95·26	Total height of tree = 84 feet. Girth at breast-height = 5 feet 5 inches. Contents of tree by square of ¼ girth × height = 154 cubic feet. Actual contents of— Timber = 95 cubic feet. Firewood = 19 „ Entire tree = 114 „
			2	58	1·859	10	18·59		
			3	54½	1·641	10	16·41		
			4	52½	1·523	10	15·23		
			5	48½	1·299	10	12·99		
			6	43½	1·045	10	10·45		
		Firewood,	7	38	0·798	10	7·98	19·07	
			8	30	0·497	10	4·97		
			9	13	0·093	10	0·93		
	Branches ...	Firewood,	1	15	0·124	4	0·50		Hence reducing factor for— Timber = 0·617 Firewood = 0·123 Entire tree = 0·740
			2	14	0·108	8	0·86		
			3	12	0·079	38	2·00		
			4	9	0·045	14	0·63		
			5	6	0·020	10	0·20		
12	Trunk ...	Timber ...	1	61	2·056	10	20·56	81·70	Total height of tree = 91 feet. Girth at breast = height = 5 feet 4 inches. Contents of tree by square of ¼ girth × height = 162 cubic feet. Actual contents of— Timber = 82 cubic feet. Firewood = 21 „ Entire tree = 103 „
			2	58	1·859	10	18·59		
			3	55½	1·701	10	17·01		
			4	50½	1·410	10	14·10		
			5	45½	1·144	10	11·44		
		Firewood,	6	40	0·884	10	8·84	21·41	
			7	32½	0·584	10	5·84		
			8	22	0·267	10	2·67		
			9	12½	0·086	6	0·52		
	Branches ...	Firewood,	1	14	0·108	6	0·65		Hence reducing factor for— Timber = 0·506. Firewood = 0·130. Entire tree = 0·636.
			2	12	0·079	22	1·74		
			3	10	0·055	16	0·88		
			4	9	0·045	6	0·27		
13	Trunk ...	Timber ...	1	59½	1·956	10	19·56	67·55	Total height of tree = 78 feet. Girth at breast-height = 5 feet 4 inches. Contents of tree by square of ¼ girth × height = 135 cubic feet. Actual contents of— Timber = 68 cubic feet. Firewood = 22 „ Entire tree = 90 „
			2	53	1·552	10	15·52		
			3	48	1·273	10	12·73		
			4	43½	1·045	10	10·15		
			5	41	0·929	10	9·29		
		Firewood,	6	35	0·677	10	6·77	22·34	
			7	29½	0·481	5	2·40		
	Branches ...	Firewood,	1	28	0·433	4	1·73		Hence reducing factor for— Timber = 0·504 Firewood = 0·163 Entire tree = 0·667
			2	25	0·345	4	1·38		
			3	20	0·221	14	3·09		
			4	19	0·199	12	2·39		
			5	17	0·160	2	0·32		
			6	16	0·141	6	0·85		
			7	15	0·124	4	0·50		
			8	13	0·093	2	0·19		
			9	12	0·079	15	1·18		
			10	10	0·055	20	1·10		
			11	9	0·045	3	0·13		
			12	8	0·036	4	0·14		
			13	7	0·027	4	0·11		
			14	6	0·020	3	0·06		

APPENDIX II.—(*continued*).

Computation of cubical contents of second class chir trees and of factors for reducing contents by the commercial method to true contents.

Number of type tree.	Part of tree.	Whether timber or firewood.	Running number of log or group of billets of the same girth.	Mean girth of log or billet in inches.	Area of section in square feet.	Length in feet of log or aggregate length of billets of the same girth.	Contents per log or group of billets of the same girth.	Total contents.	Remarks.
14	Trunk ...	Timber ...	1	58½	1·891	10	18·91	84·60	Total height of tree = 84 feet. Girth of breast-height = 5 feet 2 inches. Contents of tree by square of ¼ girth × height = 140 cubic feet.
			2	53½	1·582	10	15·82		
			3	51½	1·466	10	14·66		
			4	49½	1·354	10	13·54		
			5	46	1·169	10	11·69		
			6	42½	0·998	10	9·98		
			7	36½	0·736	10	7·36		Actual contents of— Timber = 85 cubic feet. Firewood = 18 " Entire tree = 103 " Hence reducing factor for— Timber = 0·607 Firewood = 0·129 Entire tree = 0·736
	Branches ...	Firewood,	1	20	0·221	3	0·66	18·12	
			2	19	0·199	6	1·19		
			3	18	0·179	12	2·15		
			4	14	0·108	3	0·32		
			5	13	0·093	22	2·05		
			6	12	0·079	18	1·42		
			7	10	0·055	9	0·49		
			8	9	0·045	31	1·39		
			9	8	0·036	22	0·79		
			10	7	0·027	11	0·30		
15	Trunk ...	Timber ...	1	60½	2·023	10	20·23	92·73	Total height of tree = 104 feet. Girth at breast-height = 5 feet 1 inch. Contents of tree by square of ¼ girth × height = 168 cubic feet.
			2	58	1·859	10	18·59		
			3	53½	1·582	10	15·82		
			4	51	1·437	10	14·37		
			5	49	1·327	10	13·27		
			6	43½	1·045	10	10·45		
		Firewood,	7	37	0·757	10	7·57	20·34	Actual contents of— Timber = 93 cubic feet. Firewood = 20 " Entire tree = 113 " Hence reducing factor for— Timber = 0·554 Firewood = 0·119 Entire tree = 0·073
			8	31	0·531	10	5·31		
			9	24	0·318	10	3·18		
			10	14½	0·116	10	1·16		
	Branches ...	Firewood,	1	11	0·067	18	1·21		
			2	10	0·055	16	0·88		
			3	9	0·045	18	0·81		
			4	8	0·036	6	0·22		
16	Trunk ...	Timber ...	1	59	1·924	10	19·24	85·00	Total height of tree = 98 feet. Girth at breast-height = 5 feet. Contents of tree by square of ¼ girth × height = 153 cubic feet.
			2	56½	1·764	10	17·64		
			3	53	1·552	10	15·52		
			4	48½	1·299	10	12·99		
			5	44	1·077	10	10·77		
			6	40	0·884	10	8·84		Actual contents of— Timber = 85 cubic feet. Firewood = 14 " Entire tree = 99 " Hence reducing factor for— Timber = 0·556 Firewood = 0·091 Entire tree = 0·647
		Firewood,	7	35	0·677	10	6·77	14·09	
			8	26	0·374	10	3·74		
			9	15	0·124	10	1·24		
	Branches ...	Firewood,	1	12	0·079	13	1·03		
			2	9	0·045	11	0·49		
			3	7	0·027	13	0·35		
			4	6	0·020	10	0·20		
			5	5	0·014	19	0·27		
17	Trunk ...	Timber ...	1	58	1·859	10	18·59	76·69	Total height of tree = 74 feet. Girth at breast-height = 4 feet 10 inches. Contents of tree by square of ¼ girth × height = 108 cubic feet.
			2	56	1·733	10	17·33		
			3	52½	1·523	10	15·23		
			4	50½	1·410	10	14·10		
			5	45½	1·144	10	11·44		
		Firewood,	6	37	0·757	10	7·57	21·69	Actual contents of— Timber = 77 cubic feet. Firewood = 22 " Entire tree = 99 " Hence reducing factor for— Timber = 0·713 Firewood = 0·204 Entire tree = 0·917
			7	30½	0·514	10	5·14		
	Branches ...	Firewood,	1	19	0·199	8	1·59		
			2	15	0·124	13	1·61		
			3	14	0·108	30	3·24		
			4	13	0·093	18	1·67		
			5	12	0·079	11	0·87		

APPENDIX II.—(*concluded*).

Computation of cubical contents of second class chir trees and of factors for reducing contents by the commercial method to true contents.

Number of type tree.	Part of tree.	Whether timber or firewood.	Running number of log or group of billets of the same girth.	Mean girth of log or billet in inches.	Area of section in square feet.	Length in feet of log or aggregate length of billets of the same girth.	Contents per log or group of billets of the same girth.	Total contents.	Remarks.
18	Trunk ...	Timber ...	1	56	1·733	10	17·33	72·15	Total height of tree = 104 feet.
			2	54½	1·641	10	16·41		Girth at breast-height = 4 feet 9 inches.
			3	52½	1·523	10	15·23		Contents of tree by square of ¼ girth × height = 147 cubic feet.
			4	48	1·273	10	12·73		
			5	43½	1·045	10	10·45		
		Firewood	6	40	0·884	10	8·84		Actual contents of—
			7	35	0·677	10	6·77		Timber = 72 cubic feet.
			8	29	0·465	10	4·65		Firewood = 31 "
			9	20½	0·232	10	2·32		Entire tree = 103 "
			10	7	0·027	10	0·27		
	Branches ...	Firewood	1	18	0·179	3	0·54	30·90	Hence reducing factor for—
			2	15	0·124	13	1·61		Timber = 0·490
			3	14	0·108	17	1·84		Firewood = 0·210
			4	13	0·093	8	0·74		Entire tree = 0·700
			5	12	0·079	14	0·32		
			6	10	0·055	45	2·47		
			7	9	0·045	7	0·81		
			8	8	0·036	6	0·22		
19	Trunk ...	Timber ...	1	53	1·552	10	15·52	60·49	Total height of tree = 79 feet.
			2	48½	1·299	10	12·99		Girth at breast-height = 4 feet 8 inches.
			3	46	1·169	10	11·69		Contents of tree by square of ¼ girth × height = 108 cubic feet.
			4	44	0·077	10	10·77		
			5	41½	1·952	10	9·52		
			6	34	0·639	10	6·39		Actual contents of—
			7	21	0·244	10	2·44		Timber = 60 cubic feet.
			8	13½	0·101	1	0·10		Firewood = 15 "
									Entire tree = 75 "
	Branches ...	Firewood	1	11	0·067	37	2·48	15·24	Hence reducing factor for—
			2	10	0·055	21	1·15		Timber = 0·556
			3	9	0·045	13	0·58		Firewood = 0·139
			4	8	0·036	13	0·47		Entire tree = 0·695
			5	7	0·027	2	0·05		
			6	6	0·020	48	0·96		
			7	5	0·014	44	0·62		
20	Trunk ...	Timber ...	1	54	1·611	10	16·11	64·22	Total height of tree = 98 feet.
			2	51½	1·466	10	14·66		Girth at breast-height = 4 feet 7 inches.
			3	48½	1·299	10	12·99		Contents of tree by square of ¼ girth × height = 129 cubic feet.
			4	44½	1·094	10	10·94		
			5	41½	0·952	10	9·52		
			6	37	0·757	10	7·57		
		Firewood	7	31½	0·531	10	5·31		Actual contents of—
			8	24½	0·332	10	3·32		Timber = 64 cubic feet.
			9	14	0·108	10	1·08		Firewood = 20 "
			10	4	0·209	4	0·04		Entire tree = 84 "
	Branches ...	Firewood	1	11	0·067	8	0·54	19·56	Hence reducing factor for—
			2	10	0·055	9	0·49		Timber = 0·496
			3	9	0·045	18	0·81		Firewood = 0·155
			4	8	0·036	11	0·40		Entire tree = 0·651

APPENDIX III.

SUMMARY OF PRECEDING WORKING PLAN.

TIMBER.

Standing stock of chír by girth-classes.

Class	I.	II.	III.	IV.
Number	4,987	16,987	48,362	115,944

These figures include the fellings already completed of 1885-86.

Quantity of chír exploitable during next 60 years.

Species.	Classes.	Number of trees utilizable for		Cubic feet of timber.	100lb maunds of firewood.	Remarks.
		Timber.	Fuel.			
Chír ...	I.	2,345	2,642	234,500	322,370	The entire standing stock.
	II.	3,052	5,470	183,120	360,760	About 50 per cent. of standing stock.
	III.	4,780	9,762	95,600	220,785	„ 30 „ „ „ „
	IV.	...	46,364	...	324,548	„ 40 „ „ „ „
Total ...	...	10,177	64,238	5,13,220	1,228,463	

N. B.—Ratios of figures in column 3 to those in column 4 are approximately for class I, 47 : 53 ; for class II, 40 to 60 ; for class III, 33 to 67.

Of the 513,220 cubic feet shown as utilizable as timber right-holding villagers will probably take—

Class I., 1,284 trees ... ... } =180,320 cubic feet of timber in the round.
„ II., 396 „ ... ...
„ III., 1,408 „ ... ...

The balance of timber at the free disposal of the Department will, therefore, be—

Class I., 1,061 trees ... ... } =332,900 cubic feet in the round.
„ II., 2,656 „ ... ...
„ III., 3,372 ... ...

The valuation survey of the proposed reserve (area annexed from the late Iron Works Company's forests) shows that during the same 60 years 358,780 cubic feet of chír timber in the round will be available, of which 271,200 cubic feet will be required to meet village rights, thus leaving 99,580 cubic feet at the disposal of the Department.

— The estimated annual requirements of the settlement in respect of timber is 20,000 sawn cubic feet=40,000 cubic in the round.

Proposed fellings for the first 10 years.

1886-87, 1887-88 } Bhawáli, 1, 14, 13, 4, 7, 9, 11, and 12.

1888-89, 1889-90 } Budhlákot 1 and 2.

1890-91, 1895-96 } The Ninglát forests which, it is believed, will be made over at once to the Department.

During 1886-90, 160,000 cubic feet will be taken in this manner out of the original protected forest. The balance of 140,420 cubic feet will be spread over the entire period of 60 years in order to meet petty demands of settlers, Department Public Works, &c.

The exploitation of the 99,580 cubic feet in the proposed reserve is postponed beyond the 10-years sub-period owing to the present degraded condition of the stock.

FIREWOOD.

The standing stock of what are practically purely fuel trees is shown in the annexed statement:—

* Drawn up at the request of Mr. Greig.

Standing stock of fuel trees by girth-classes and species.

	I.	II.	III.	IV.
Sál	133	597	2,045	11,822
Sain	132	354	1,449	4,098
Cypress	18	23	137	713
Phanyáth	111	276	1,042	632
Bánj	17,330	22,523	49,540	137,478
Tilonj	3,760	3,829	7,023	21,492
Riánj	819	1,040	2,041	5,236
Kharsu	1,295	2,087	5,966	12,097
Ayár	806	2,077	9,695	42,365
Rhododendron	6,488	12,602	31,140	90,059
Total ..	30,892	45,408	110,978	327,992

The above figures include the Ayárpáta block, which is, however, left out of account in all subsequent calculations, as it is soon to be exchanged for a portion of forest belonging to the municipality.

Quantity of fuel exploitable during the 60 years.

	Girth-class.	*Number of trees.*	100lb *maunds.*
Counted trees of other kinds than chír ...	I.	29,998	2,305,165
	II.	30,107	1,007,342
	III.	48,627	540,834
	IV.	126,433	387,012
Total ...		235,245	4,240,353
Chír unsuitable for timber ...	I.	2,642	228,570
	II.	5,470	284,460
	III.	9,762	163,425
	IV.	46,364	324,548
Total ...		64,238	1,001,003
Sawing refuse from chír fellings ...			227,460
Total from counted chir trees ...			1,228,463
Yield of uncounted species in surveyed area			1,800,000
" standing poles under 18 inches in girth of counted species in surveyed area			2,000,000
" trees in unsurveyed area			800,000
" thinnings in new generation to be established ...			1,000,000
Total in original protected forest ...			11,200,000
To the above add estimated quantity of exploitable fire-wood in proposed reserve			6,500,000
GRAND TOTAL ...			17,700,000

In estimating proportion of exploitable trees out of total number standing, all the first class have been taken and the following percentages of the other classes :—

	Girth-class II.	III.	IV.	per cent.
Sál and sain ...	30	40	40	"
Oaks	30	40	40	"
Brons	30	50	40	"
Ayár	80	60	40	"

The distribution of the supply will be as follows :—

	Maunds.
Right-holders, graziers, and wayfarers' requirements	7,800,000
Leaving a disposable balance of	9,900,000
Add quantity expected from Ninglát forests	1,800,000
Total disposable ...	11,700,000
= Annual yield of ...	195,000

This annual yield will provide for the following requirements :—

Firewood for troops	26,000
" " residents of settlement	81,000
" " hard-wood charcoal	80,000
" " chír "	3,000
" " burning lime	5,000
Total ...	195,000

Fuel operations for the first 10 *years.*

Firewood for troops.—The area within a radius of about 5 miles round the commissariat fuel depôt has been divided into 10 more or less equivalent parts, one part to be worked each year, as explained on pages 195 to 198. A certain portion of the annual demand will be supplied from sawing refuse and from windfalls and landslips on a large scale within that radius.

Charcoal.—The wood for charcoal will be supplied from outside the 5-mile radius, by means of special fellings within a definite area each year, as shown on pages 191 to 199.

Lime-burning.—The necessary wood will be supplied from portions in the neighbourhood of Belwa and Aru Khans and of Adhora, as explained on page 199. To meet other demands these portions will be worked lightly or not at all, as the case during any particular year may require.

Firewood for residents.—This will come (1) from felling area for supply of troops; (2) from windfalls and dead trees in the remaining nine portions within the 5-mile radius, and (3) from sufficiently accessible portions outside that radius. In the first area special coppice improvement fellings of low scrub will be made for the benefit of the residents.

Amount of chir estimated to stand at the end of 60 *years in the protected forest.*

Girth-class.	NUMBER OF TREES.			STOCK AT THE END OF THE 60 YEARS.				
					EXPLOITABLE.			
					Number of trees.		*Quantity.*	
	Standing in 1885.	To be felled during the 60 years.	Left standing	Total number of trees.	Suitable for timber.	Suitable only for fuel.	Cubic feet of timber.	Maunds of fuel.
I ...	5,987	4,987	...	8,465	4,300	2,865	430,000	415,525
II ...	16,987	8,522	8,465	45,200	5,000	3,600	300,000	312,200
III ...	48,362	14,542	33,820	109,200	14,000	17,500	280,000	535,500
IV ...	115,944	46,364	69,580	261,000	...	96,000	...	672,000
Total ...	186,280	74,415	111,865	423,925	23,300	119,965	1,010,000	1,935,225

Explanation.—(*a*) The figures in column 5 are obtained as follows from those in column 4:—

All second class trees become first class.

All third class trees $+\frac{1}{6}$ fourth class trees become second class.

The remaining $\frac{5}{6}$ fourth class trees $+\frac{4}{5}$ of original number of fourth class trees become third class, except for Nalena block, for which $+\frac{7}{8}$.

The number of fourth class trees in column 5 is an estimate based on the present condition of the reproduction.

(*b*) The figures in column 6 give the number of trees after deduction for right-holders' requirements as follows:—

1st class	1,300	= 184,000 cubic feet.
2nd "	400	
3rd "	1,500	

So that the total exploitable timber will be 1,010,000+184,000=1,194,000 cubic feet.

(*c*) Able to grow into next higher class and, therefore, not to be felled—

80 per cent of second class.
70 " third "
55 " fourth "

All first class trees will be felled.

Amount of chír expected to stand in the proposed reserve at the end of 60 years.

Girth-class.	NUMBER OF TREES.			STOCK AT THE END OF THE 60 YEARS.				
					EXPLOITABLE.			
					Number of trees		*Quantity.*	
	Standing in 1885.	To be felled during the 60 years.	Left standing.	Total number of trees.	Suitable for timber.	Suitable only for fuel.	Cubic feet of timber.	Maunds of fuel.
I ...	3,597	3,597	...	6,045	4,500	1,545	450,000	311,325
II ...	8,815	2,770	6,045	13,000	1,800	800	108,000	418,600
III ...	12,019	2,915	9,104	36,000	5,000	6,000	100,000	186,000
IV ...	30,691	6,680	24,011	50,000	...	20,000	...	140,000
Total ...	55,122	15,962	39,160	105,045	11,300	28,345	658,000	1,055,925

Amount of fuel trees estimated to stand at the end of 60 years in the protected forest, excluding the Ayárpáta Block.

		NUMBER OF TREES.			STOCK AT THE END OF THE 60 YEARS.					
							QUANTITY EXPLOITABLE.			
							Number of trees utilizable for		*Quantity.*	
		Standing in 1885.	To be felled during the 60 years.	Left standing.	Total number of trees.	How figures in column 6 have been obtained from column 5.	Timber.	Fuel only.	Cubic feet of timber.	Maunds of firewood.
Sál ...	I	133	133	...	240	II	160	80	8,000	4,000
	II	597	357	240	1,697	III	380	120	11,400	2,400
	III	2,945	1,195	1,750	7,110	IV	2,060	940	20,600	7,520
	IV	11,822	4,712	7,110	15,000	Estimated.	3,000	4,000	6,000	16,000
Total ..	...	15,444	6,397	9,047	24,047		5,600	5,140	46,000	29,920
Sain ...	I	132	132	...	115	II	70	45	3,500	2,475
	II	354	239	115	896	III	160	140	4,800	2,800
	III	1,449	553	896	2,598	IV	400	600	3,200	6,000
	IV	4,098	1,500	2,598	5,850	Estimated.	...	2,500	...	15,000
Total ...	...	6,033	2,424	3,609	9,459		630	3,285	11,500	26,275
Oaks ...	I	22,584	22,584	...	27,040	II + ⅓III	..	27,040	...	4,233,600
	II	29,088	20,548	8,540	89,600	⅓III + ⅔IV	...	40,000	...	1,600,000
	III	64,334	26,034	38,300	177,200	⅓IV + ⅔IV	...	50,000	...	750,000
	IV	172,440	69,240	103,200	359,000	Estimated.	...	140,000	...	560,000
Total ...	...	288,446	138,406	150,040	652,840		...	257,040	...	3,543,600
Ayár ...	I	836	836	...	450	II	...	450	...	15,750
	II	2,215	1,765	450	4,300	III	...	4,300	...	77,400
	III	10,635	6,335	4,300	31,810	IV + ⅓IV	..	10,000	...	60,000
	IV	45,911	18,608	27,303	69,030	Estimated.	...	30,000	...	45,000
Total ...	...	59,697	27,544	32,053	105,590		...	44,750	...	198,150
Brons ...	I	6,521	6,521	...	9,200	II + ⅓III	...	9,200	...	322,000
	II	12,919	7,792	3,900	31,900	⅔III + ⅓IV	...	15,000	...	270,000
	III	32,964	16,764	16,200	94,050	⅓IV + IV	...	30,000	...	180,000
	IV	94,942	38,242	56,700	188,200	Estimated.	...	70,000	...	105,000
Total ...	...	147,346	69,319	76,800	323,350		5,100	123,710	...	877,000
									GRAND TOTAL ...	6,474,945

Explanation.—The figures in column 8 give the number of trees after deduction of right-holders' requirements.

Total amount of saleable firewood.

	Maunds.
Chír in the protected forest	1,935,225
Hard woods	6,474,945
Chír in the proposed reserve	1,055,925
Total ...	9,466,095

The above figures do not of course include the quota from unsurveyed areas unclassed poles and uncounted species, which quota will be more than double of that for the first 60 years.

The future stock and yield of firewood from trees other than chír in the proposed reserve cannot evidently, in the absence of enumeration surveys, be estimated.

E. E. FERNANDEZ.

APPENDIX IV.

List of the more common trees and shrubs with their local names.

No.	Systematic name.	Kumáoni.	Garhwáli.	Doṭiál.
1	*Clemotis montana* ...	Kánguli ...	Kánguli ...	Bílúbánia.
2	*Pæonia Emodi* ...	?	Chandra ...	?
3	*Cocculus laurifolius* ...	Tilphokra, tilpharo ...	Tilphára ...	Titpáro.
4	*Cissampelos Pareira* ...	Gajuṛo ...	Pára ...	Bátulpátia.
5	*Berberis aristata* ...	Kilmoṛa, chathur ...	Kingoṛa, chutrú, chotra,	Chutro.
6	*Do. Lycium* ...	?	Kirmoṛra ...	?
7	*Do. asiatica* ...	?	?	?
8	*Pittosporum eriocarpum* ...	Agni ...	Tumṛi ...	Kakṛia.
9	*Eurya joponica* ...	Bauri ...	Chheṇa ...	Jingan.
10	*Sarauja nepalensis* ...	Pangára, gogania, gogiṇo.	Gogano ...	Gogan.
11	*Shorea robusta* ...	Sál ...	Shál, kandár ...	Sál.
12	*Bombax malabaricum* ...	Shimlo ...	Shímal ...	Shímal.
13	*Sterculia villosa* ...	Fudálú ...	Událú ...	Udalia.
14	*Grewia appositifolia* ...	Bhiúnl ...	Bhiúnl ...	Bhimal.
15	*Do. vestita* ...	Pharsúli ...	Pharsáwon, pharsanyi,	Pharson.
16	*Reinwardtia pubescens* ...	Tíla ...	Pienwli ...	?
17	*Hiptage Madablota* ...	Bánda, ajári ...	Banda, ranota ...	?
18	*Zanthoxylum alatum* ...	Tímúr ...	Tejmal, ṭimrú ...	Ṭimṛú.
19	*Murraya exotica* ...	?	Marchula ...	?
20	*Do. Kœnigii* ...	Ganflo, ganni ...	Gandela ...	Kari.
21	*Skimmia Laureola* ...	Nayalpáti ...	Narpáti ...	Narlú
22	*Citrus medica* ...	Nímmu ...	Limma ...	Nímua.
23	*Garuga pinnata* ...	Kamman ...	Kanman ...	?
24	*Melia Azedarach* ...	Bítaṇ ...	Denkan ...	Bitráyan.
25	*Cedrela Toona* ...	Túṇi ...	Túṇ ...	Ṭúni.
26	*Do. serrata* ...	Dala, soni ...	Dala ...	?
27	*Ilex dipyrena* ...	Kaṇḍailo bánj, kaṇṭal,	Kaṇḍailo kaṇḍrai, gardár.	Ṭhinkiyo, ílso.
28	*Do. exsulca* ...	Kaṭonj ...	?	Káṇía gaṛúl.
29	*Do. odorata* ...	Gaḍkaṇíra, gadmel ...	Gaḍgair, gadáru ...	Soṇ.
30	*Euonymus pendulus* ...	Gaḍhmel, potlí, kúnkún.	Gaḍhmel, ṇoṇia, katkúnkún.	Dhuso, bagelpatia.
31	*Do. tingens* ...	Gwáli, kúnkún ...	Kúnkún ...	Keshinbaṛú.
32	*Do. echinatus* ...	Palo ...	Ládulí ...	?
33	*Elæodendron Roxburghii* ...	Khodo ...	Dhebri ...	?
34	*Rhamnus dahurious* ...	Chhendúl, charyúlo ...	Chhendula, chhíṭhula...	Chariálo.
35	*Do. purpureus* ...	Payán ...	Bakauro, banáru ...	?
36	*Do. persicus* ...	Charyúlo ...	Chhetulo ...	Charyúlo.
37	*Vitis parvifolia* ...	Pari ...	Bámni bhinḍuṇa ...	?
38	*Do. lanata* ...	?	Bhinḍuṇa ...	?
39	*Do. himalayana* ...	Tipti ...	Philuṇa ...	?
40	*Do. latifolia* ...	Purúni, Asojia ...	Bhiluṇa Bhinḍuṇa ...	Puraino.
41	*Do. sp.* ...	Rámkiálu ...	?	Gophla.
42	*Æsculus indica* ...	Pángar ...	Pángar ...	?
43	*Acer oblongum* ...	Potái, putli ...	Kirmola, chhoti potli...	Pángyála
44	*Do. pictum* ...	Tikṭa, pata, bankímu...	Gadkímu, potli, dumitha.	Chindia, tiláni, chitulia.
45	*Meliosma dilleniæfolia* ...	?	Moya ...	Patmoya.
46	*Rhus Cotinus* ...	Túng, gaḍtúng ...	Thúnga, jaltúnga ...	Chíchṛi.
47	*Do. semialata* ...	Dhatmíla ...	Dasmila, khunkia ...	Bhánkachu.
48	*Do. vernicifera* ...	Kaṭhbhaliáo ...	Ulkhuru, khonki ...	Kákbhaláo.
49	*Pistacia integerrima* ...	Ban túṇi ...	Kákhar ...	Gadúli.
50	*Sophora mollis* ...	Khuṇmaṇi ...	Bhatula ...	?
51	*Indigofera atropurpurea* ...	Ghans sakini ...	Mushia sakini ...	Bayán shakinia.
52	*Do. violacea* ...	Sagini ...	Sakino ...	Saginia.
53	*Erythrina arborescens* ...	Mandiáru ...	Mandáru ...	Roṛim.
54	*Pueraria tuberosa* ...	Birála ...	Sirála ...	?
55	*Desmodium tiliæfolium* ...	Bhatula, chamlia ...	Chamlái ...	Bhaṭia.
56	*Lespedeza macrostyla* ...	?	...	...
57	*Ouginia dalbergioides* ...	Sándan ...	Sándan ...	Sándan.
58	*Dalbergia Sissoo* ...	Shísham ...	Shísham ...	?
59	*Do. hircina* ...	Giguṛa, goghíra ...	Bhandír ...	Goguṛu.
60	*Bauhinia purpurea* ...	?	Gairál ...	?
61	*Do. variegata* ...	Kúrál ...	Cuirál ...	Kwaral.
62	*Do. retusa* ...	Kaṇálu ...	Kandiáwa ...	?
63	*Do. Vahlii* ...	Málú ...	Málú ...	Málú.
64	*Mimosa rubicaulis* ...	Kingri, kachraunṭa ...	Khingri ...	Aiṛi.
65	*Albizzia Julibrissin* ...	Kuláṛi ...	Kauner ...	Sirs.
66	*Acacia Catechu* ...	Khair ...	Khair ...	Khair.
67	*Prunus armeniaca* ...	Chuáru ...	Chuálu ...	Kusmia áru.
68	*Do. Puddum* ...	Payán ...	Payán ...	Pangia.
69	*Do. Padus* ...	Chhnní ...	?	?
70	*Prinsepia utilis* ...	Jhaṭela ...	Jhaṭena ...	Bhekal.
71	*Spiræa canescens* ...	Bhúti ...	Kaṭmaṭialna ...	?
72	*Rubus paniculatus* ...	Kalia hinsálo ...	Karailo ...	Katriya.
73	*Do. flavus* ...	Hinsolo, hinsra ...	Hisálu, hinsálo ...	Ashiálo.
74	*Do. lasiocarpus* ...	Kálá hisra ...	Kalá ishol ...	?
75	*Do. roseæfolius* ...	Kaṇ hinsala ...	Kan hinsola ...	?
76	*Do. biflorus* ...	Jogia hinsola ...	Hinsola ...	?
77	*Rosa moschata* ...	Kúnja ...	Kúṇja, kúṇju ...	Kúnenli.
78	*Do. macrophylla* ...	Triphúla ...	Daṇḍ kúṇju ...	Daṇḍ kúnenli.
79	*Pyrus Pashia* ...	Melu, mel ...	Mehl ...	Mel.
80	*Cratægus Pyracantha* ...	Ghingári ...	Ghingáru ...	Gangáru.

List of the more common trees and shrubs with their local names—(continued).

No.	Systematic name.	Kumáoni.	Garhwáli.	Dotiál.
81	*Cotoneaster ocuminata* ...	?	Runínsh ...	Rucns.
82	*Do. microphylla* ...	Ghari, ghaḍuli ...	Marchia, ghairi, parkulia,	?
83	*Stransvesia glaucescens* ...	Gaḍmeuli ...	Gadáru ...	?
84	*Deutzia staminea* ...	Bháti ...	Makamanni, mauni ...	?
85	*Terminalia belerica* ...	Bairo ...	Rairo ...	?
86	*Do. Chebula* ...	Haira ...	Haira, harra ...	Harra.
87	*Do. tomentosa* ...	Sain ...	Sain ...	?
88	*Eugenia Jambolana* ...	Jámaṇ ...	Jamuṇo ...	Jámanu.
89	*Woodfordia floribunda* ...	Dhaulo ...	Dhaulo ...	Dháya.
90	*Punica Granatum* ...	Daram, dármi ...	Dalmi ...	Darim.
91	*Casearia graveolens* ..	Nar, pínpriya ...	Naro, nara, pinpri ...	Kakri.
92	*Hedera Helix* ...	Banu, malkauni ...	Kaṭhmáu, belbandá ...	Larbogaṭia.
93	*Heptapleurum venulosum* ...	Dondu shimal, kutnon,	Kutshímal ...	Koṭi shímal.
94	*Marlea begoniæfolia* ...	Káksha ...	Gadkimu ...	?
95	*Cornus macrophylla* ...	Kalshi, khaksho ...	Khagshi ...	Chilánia.
96	*Do. oblonga* ...	Baunri ...	Kaṭkaṇai ...	Ṭiṭmolia.
97	*Do. sanguinea* ..	?	Ghogsa ...	?
98	*Do. capitula* ..	Bamora ...	Bhamora ...	?
99	*Lonicera quinquelocularis* ...	Dayáro, bhadkukri ...	Bhadkukhuro ...	Pánípatia.
100	*Leycesteria formosa* ...	Dúni ...	Gwáli ...	?
101	*Abelia triflora* ...	Danton ...	Bhartula ...	?
102	*Viburnum cotinifolium* ..	Gúi ...	Bansúra, Gúwa, gendu,	Bansuro ardalia.
103	*Do. stellulatum* ...	Titmolia, titmoya ...	Ṭiṭmolia, ṭiṭmoya, máleo.	Malia.
104	*Do. coriaceum* ...	?	Ṭiṭmolia, karwi ...	?
105	*Do. punctatum* ...	?	Gaunta ...	?
106	*Sambucus Ebulus* ...	?	?	?
107	*Wendlandia exserta* ...	Kaṭṭito ...	?	?
108	*Randia sp.* ...	Baṛúli, ghari ...	Debri, ban dármi ...	Bígtia.
109	*Pavetta tomentosa* ...	Tumria ...	Pandia ...	Dhúrsú.
110	*Leptodermis lanceolata* ...	Padyeuro ...	Padara ...	Bíríguya.
111	*Leucomeris spectabilis* ...	Kapashi ...	Pándu ...	?
112	*Pieris ovalifolia* ...	Anyar ...	Anyar ...	Anyar.
113	*Rhododendron arboreum* ...	Brons ...	Buráns ...	Garáns.
114	*Mæsa africana* ...	Ghari ...	Jhiún ...	Jasún.
115	*Myrsine semiserrata* ...	Gaunt .	Gaunt ...	Gauntia.
116	*Bassia butyracea* ...	Chiura ...	Chiura ...	?
117	*Symplocos cratægoides* ...	Lodhia, lod .	Lodh, lodo, lawádho ...	Lodh, lod
118	*Do. ramosissima* ...	?	?	?
119	*Fraxinus floribunda* ...	Ango ...	Ango ...	Ango.
120	*Olea glandulifera* ...	Kúnṭia gaḍúl ...	Gair ...	Gaḍúli.
121	*Jasminum arborescens* ...	Gaunt ...	?	Gauntia.
122	*Do. dispermum* ...	?	Surmári ...	Sabed jáyo.
123	*Do. revolutum* ...	Jái ...	Jai, chameli ...	Jáya.
124	*Nyctanthes Arbotristis* ...	?	Kúri ...	?
125	*Ichnocarpus frutescens* ...	?	Lega beḍula ...	?
126	*Marsdenia tenacissima* ...	Murkula ...	Moria ...	Gorailu.
127	*Do. Roylei* ...	?	Shingori ...	?
128	*Pergularia odoratissima* ...	Gedúra ...	Mora ...	Láṭi koshiára.
129	*Cordia Myxa* ...	Lisaro ...	Lisáro ...	Nanu buriálu.
130	*Clerodendron serratum* ...	Mauno ...	Makámauna ...	Ashigulgulia.
131	*Callicarpa macrophylla* ...	Daya, birmolo ...	Inḍu ...	Dhuruchú.
132	*Do. arborea* ...	?	Daya, phurpatia ...	?
133	*Cinnamomum Tamala* ...	?	Dálchíni ...	?
134	*Pæbe lanceolata* ...	Sunkaulo ...	Kaṭkaula ...	Wowolo.
135	*Machilus odoratissima* ...	Kaula ...	Kaula ...	Kaula.
136	*Tetranthera laurifolia* ...	Churo ...	Shingrau ...	Garoli.
137	*Litsæa lanuginosa* ...	?	Katkaul ...	?
138	*Daphnidium pulcherimum* ...	Phatgoli ...	Kaṭkaula ...	Dálchíni kaulo.
139	*Daphne papyracea* ...	Satpurwa ...	Satpura ...	Baḍu.
140	*Wikstræmia virgata* ...	Chamlia, chamleṭu ...	Chamleṭu ...	Baḍu koshánk, shiperi.
141	*Elæagnus latifolia* ...	?	Gaya ...	?
142	*Do. umbellata* ...	?	Ginwanin ...	?
143	*Viscum articulatum* ...	Bánda ...	Bánda ...	Bánda.
144	*Do. attenualum* ...	Do. ...	Do. ...	Do.
145	*Loranthus vestitus* ...	Bánia ...	Do. ...	Do.
146	*Do. cordifolius* ...	?	Do. ...	?
147	*Osyris arborea* ...	Dalima ...	Dálmi ...	?
148	*Bœmehria rugulosa* ...	Genṭhi ...	Genṭhi ...	Genṭhi.
149	*Do. platyphylla* ...	Galpata ...	Khagsho ..	Kharshiáti
150	*Debregeasia longifolia* ...	?	?	?
151	*Do. bicolor* ...	Tusáro, tushera, tushiára.	Tusára ...	Ṭusaro.
152	*Morus serrata* ...	Kímu ...	Kímu ..	Kímu.
153	*Ficus Wightiana* ..	Pilak, dudil ...	Khilka, parkulo, ṭhilka,	Dudulú.
154	*Do. sp.* ...	Bedui ...	Beduli ...	Bedulo.
155	*Do. virgata* ...	Beḍu ...	Beḍu ...	Beḍu.
156	*Do. Cunia*	Kheunía ...	Khaina ...	Khuṭnio.
157	*Do. Roxburghii* ...	Timal ...	Timlo ...	Timla.
158	*Do. hispidu* ...	Titmoí ...	Khagshi ...	Titmolia.
159	*Celtis australis* ...	Kharik ...	Khaṛik ..	Khaṛak.
160	*Ulmus Wallichiana* ...	?	Chamarmawa ...	Chamria khaṛik.
161	*Euphorbia Royleana* ...	?	?	?
162	*Excæcaria* ...	Khiṇṇo ...	Khiṇṇo ...	Khira.
163	*Mallotus philippinensis* ...	?	Roiṇa ...	?

List of the more common trees and shrubs with their local names—(concluded).

No.	Systematic name.	Kumáoni.	Garhwáli.	Doṭiál.
164	*Bischoffia javanica* ...	?	Kain ...	?
165	*Briedelia montana* ...	?	?	?
166	*Do. retusa* ...	Kaṭgauja ...	Dhaulo, Gauli ...	?
167	*Phyllanthus nepalensis* ...	Kaṭmawa ...	Kaṭhmawa, katmau ...	Mawa.
168	*Securinega obovata* ...	?	?	?
169	*Andrachne cordifolia* ...	Peula ...	Bhaṭia ...	Peunria.
170	*Sarcococca saligna* ...	?	Piru ...	?
171	*Betula acuminota* ...	Baṇ utís, payán utís ...	Utís, saur ...	Shaur.
172	*Alnus nepalensis* ...	Utís ...	Utís ...	?
173	*Salix daphnoides* ...	Bainsh, khurinso ...	Karwi ...	Bains.
174	*Do. babylonica* ...	Majhiuṇo ...	Gaḍbains, manjan ...	Láwria bains.
175	*Do. elegans* ...	Kale bainsh ...	Kaṛwi ...	Bainsu.
176	*Populus ciliata* ...	Baṇ pipal ...	Chalni ...	Gad pipal.
177	*Quercus semecarpifolia* ...	Kharsú ...	Kharsú ...	Dhinia bánj.
178	*Do. lanuginosa* ...	Ránj ...	Kiáni ...	?
179	*Do. incana* ...	Bánj ...	Bánj ...	Kharánj, tikiá bánj, chirkia bánj.
180	*Do. dilatata* ...	Kilonj ...	Tilonj, tilanj ...	Bhiria kharsu.
181	*Do. annulata* ...	Phanyáth ...	Phanát ...	?
182	*Castanopsis indica* ...	?	Ghiseri ghogsa, ghogu,	?
183	*Carpinus viminea* ...	Phamnái, Phayon, chamria, ban kharik, chamasṛi.	Kiri, gad kharik, pamnái, chamleto.	Chamria, gadayú.
184	*Myrica sapida* ...	Káphal ...	Káphal ...	?
185	*Juglans ragia* ...	Gungia akhoṛ, akhor ...	Akhor ...	Ukhar.
186	*Engelhardtia Colebrookiana* ..	Mawa ...	Gadhmawa ...	Bhairon, mayá.
187	*Pinus longifolia* ...	Cher sala ...	Cher, kulaun ...	Salo.
188	*Cedrus Deodara* ...	Diwár ...	Díwár ...	Thíngu.
189	*Cupressus torulosa* ...	Surai, ráisala ...	Rasúla ...	Dhúpi.
190	*Wallichia densiflora* ...	?	?	?
191	*Arundinaria falcata* ...	Ningálu ...	Ringálo ...	Ningla
192	*Dendrocalamus strictus* ...	Báns ...	Báns ...	?
193	*Do. Hamiltonii* ...	Do. ...	Do. ...	Do.

E. E. FERNANDEZ,
Offg. Deputy Director, Forest School.

APPENDIX V.

Rate of growth of seedlings in plantations.

Species.	Year in which sown or planted.	Age when measured.	Average Dimensions.		Locality.	Number of plants measured.
			Height in feet.	Girth (when measured) in inches.		
		Years.				
Deodár ...	1876	9	6½	4¼	Jábar	103
	1877	9	4½	4¼	Deopáta	60
	"	10	5½	4½	Chína	60
	"	10	9¼	6¼	Káhla	20
Ash ...	1879	5	2¼	1½	Upper Bhádli	12
	1881	5	3	1½	Mauláni	51
	1882	2	1½	...	Lower Bhadli	25
	1883	3	1¼	...	Maulani	15
Walnut ...	1879	6	8	½	Káhla	30
	"	6	3¾	2½	Deopáta	15
	1881	4	5¾	2½	Mauláni	50
	1883	2	2	2	Deopáta	2
Bánj ...	1878	7	2	1¾	Mauláni	21
	1879	6	3	1¾	Upper Chhatráni	20
	"	6	2¼	1½	Lower	20
Tilonj ...	1875	10	7¾	4	Ayárpáta	30
Rianj ...	1882	3	1½	¼	Mauláni	20
Kharsu ...	1881	4	2½	1	Ditto	10
Chír	1883	2	1½	...	Upper Chhatráni	30
	"	2	1½	...	Lower ditto	20

E. E. FERNANDEZ,

Offg. Deputy Director, Forest School.

APPENDIX VI.

No. 408, dated Simla, the 16th June, 1887.

From—B. RIBBENTROP, ESQ., *Offg. Inspector-General of Forests to the Govt. of India,*

To—*The Secy. to Govt., N.-W. P. and Oudh, Revenue (Forests) Department.*

SIR,—With reference to paragraph 8 of the Circular Resolution of the Government of India, in the Home Department, No. 21F., dated the 6th December, 1884, I have the honor to forward, for submission to His Honor the Lieutenant-Governor, a copy of the Working-Plan for the Naini Tál Forests in the Central Circle, prepared by Mr. E. E. Fernandez, Officiating Deputy Director of the Dehra Forest School, together with a copy of the Conservator's forwarding letter,* and of a Note† by the Assistant Inspector-General of Forests and Superintendent of Working-Plans. I would ask you to consider my remarks‡ on the Working-Plan for the Ránikhet Forests at the same time with my observations on the one now submitted, the circumstances of both sub-divisions being in many ways similar, as also the character of the two Working-Plans.

* No. 626, dated 16th February, 1887.

† Dated 22nd March, 1887.

‡ Letter No. 406, dated 16th June, 1887.

2. As in the case of the Ránikhet Plan, Parts I and II of the present work are unobjectionable, containing as they do a great store of useful, and even necessary, information well arranged. As regards Part III, which is devoted to the organisation-scheme, or Working-Plan properly so called, I entirely agree with what the Assistant Inspector-General writes in paragraph 14 of his note—namely, that this is no plan at all, but a series of proposals, based on uncertain data, in which it has all the faults, on an exaggerated scale, of the Ránikhet Working-Plan. A Working-Plan is impracticable if not founded on a fixed and immutable basis, as regards the legal status of the property, and the intentions of the owner in reference to its use and disposal. In the present instance, the whole area to which the Working-Plan relates is protected forest only, and subject to rights that have never been finally settled, and concessions which, in their present unregulated circumstances, are utterly opposed to that continuity of management and treatment without which a Working-Plan is a mere name.

3. Before any Working-Plan was attempted for these Naini Tál forests, the Working-Plans Officer should have ascertained definitely the wishes of the Local Government with respect to the use of the forests by the surrounding population, and should have arranged, in consultation with Government, for the exercise of existing rights, and the enjoyment of all practicable concessions, on such a footing as would reconcile itself to the requirements of a Working-Plan framed on economic principles of forestry. No such arrangement has been come to, and I have, therefore, no alternative but to recommend the rejection of this Working-Plan, constituting as it does a series of preliminary proposals only, which indicate merely how, under certain conditions as yet undetermined, Naini Tál is to be supplied with fuel and timber and the villagers with their requirements.

4. In conclusion, I would suggest, in reference to those forest tracts for which a Working-Plan is here considered necessary, that the Local Government should, in consultation with the Conservator, regulate the exercise of concessions within them in such a way as to render a revision of this Working-Plan possible. When making this revision, I would suggest that the various objections raised by the Assistant Inspector-General in his note should be considered, as also my marginal observations on the same.

No. 409.

Copy with copy of the Assistant Inspector-General's Note referred to, forwarded, for information, to the Conservater of Forests, Central Circle, North-Western Provinces and Oudh, with reference to his letter No. 626, dated the 16th February last.

B. RIBBENTROP,
Offg. Inspector-General of Forests.

APPENDIX VII.

Note on MR. FERNANDEZ'S *Working-Plan for the Naini Tál Forests, in the N.-W. Provinces, by the Assistant Inspector-General of Forests.*

THE field-work in connection with this plan was commenced as early as 1880 and completed in the following year, but owing to press of other work the Working-Plan itself could not be completed before June, 1886. The subsequent delay appears to have been due to the long time occupied in printing the proofs, the last instalments of which were only received by Mr. Fernandez in November. The intervening period of four years between the completion of the survey and the preparation of the plan necessitated, as a matter of course, a revision of the stock on the ground and laborious alterations in the plan itself, into which had to be incorporated all the changes that had taken place in the stock during the interval.

2. The present report is a very voluminous one, more so than that for the Ránikhet forests, with which it has, however, in other respects, so many points of resemblance (the circumstances of both localities not being very dissimilar), that we can dismiss parts I and II, after merely observing that this portion of the report is still more elaborate, and contains a great store of useful information in addition to what is essential to the preparation of the plan itself. It is ably written, and the data are carefully worked out and arranged.

On the other hand, the same remarks apply to the uncertain age of the trees, as calculated from their concentric rings; but the experiments made here, both in this respect and with a view to obtain the weight of the various woods, have been on a far more extensive scale than was the case in Ránikhet, and the results are, therefore, proportionately more reliable. The descriptions of blocks and compartments give the same class of information, and show the same absence of any special suggestions for future treatment.* This is, I think, a very serious defect. It is believed that the stock was valued—in the original protected forests at least, —by means of a complete enumeration of the standing trees above 18 inches in girth; but no information is given us on this head, although it is certainly important that we should know how the valuation was effected in each instance.

* Yes, this is important to note. It is only by these means that we can avoid making and proposing sacrifices (either financial or sylvicultural) in favour of a system for system's sake only.

B. R.

3. Coming to the Organization-Scheme or Working-Plan proper, jardinage has been selected as the most suitable form of exploitation, and knowing as I do the circumstances of these Naini Tál forests, I fully concur in its adoption.

Jardinage approved.

B. R.

4. The average age of exploitability has been fixed by Mr. Fernandez at 170 years, and the corresponding girth at 6 feet. We cannot demur to this in the case of the pine, since the object is here, unlike in Ránikhet, to obtain the maximum of sound timber, and not the maximum of fuel. On the other hand, the total stock of chír in the protected forests aggregates 186,000 only, against 528,000 trees of other species. Oaks alone number 300,000, and rhododendrons 150,000. Does this rotation of 170 years reconcile itself to the last-named species, occurring as they do in so great a majority? Or, what comes to the same thing, does the period of 60 years, during which it has been determined to remove all mature trees, and such other trees as would, in that time, come out in the natural process of thinning, meet the common requirements of the stock? According to Mr. Fernandez himself it does not. He says—page 184—that oaks and rhododendrons ought generally to be removed on attaining a girth of just over 5 feet, *i.e.*, when they are from 110 to 120 years old. By maintaining the same long period of 60 years for these secondary species, Mr. Fernandez, therefore—and he agrees to this himself—permits of a large proportion—as much as 50 and 33

These speculations ahead are hardly ever found in a modern working-plan.

B. R.

per cent. respectively—of III class oaks and rhododendrons becoming I class trees within that time; in other words, he is compelled to take stock of conditions belonging to the very remote future, and which are, as such, more or less unfathomable in our present knowledge of these forests.

5. And is this period of 60 years the best adapted, under the circumstances, to chír? The total number of I class chír tree in the Working-Circle—if we consider the so-called Reserve a part of the Working-Circle—is 5,500, and of II class trees of the same species 26,000, of the III class 60,000, and of the IV class 146,000.

If we can consider ourselves correct in removing all the above I class trees—sylvicultural considerations permitting—during the period required for an equivalent number of the younger trees to reach I class dimensions, then 30 years should be sufficient for that purpose; because, if all the 2 ,000 II class trees take 60 years only to become mature, and granting that 8,000 of them never arrive at I class dimensions, then 30 years should still be sufficient to permit of 9,000 trees of the II class attaining to I class dimensions.

This is so. Let this be taken up in revision; but provision must be made for trees which never arrive in the next class, which die, are blown down, &c.
B. R.

6. Coming now to the oaks and rhododendrons we find a total in the protected area of—

I Class	...	29,875
II „	...	42,720
III „	...	98,661
IV „	...	274,159
Total	...	445,415

In reference to these species, Mr. Fernandez remarks—page 184—that they "ought generally to be removed on attaining a girth of just over 5 feet, *i. e.*, when they are from 110 to 120 years old." The number of exploitable trees in the II class can hence be estimated at 28,480 and the total number of exploitable trees at 58,355. Against this we have a provision of 14,240 II class trees only. This is obviously not sufficient. On the other hand, the whole of the present I class trees can be looked upon as a reserve of over-mature trees—trees permitted to attain an uneconomically great age, in the absence of previous scientific management. We can justifiably ignore their presence in any future gradation of age, and can, for the same reason, omit to make a corresponding provision. It will suffice, therefore, if we fell the present stock of 58,355 exploitable trees during a period great enough to allow of 28,000 younger trees attaining to the dimensions of 5 feet in girth. We can assume that two-thirds of the present II class trees will do this, and 30 per cent. of the III class trees, total 39,000 trees (inclusive of the whole of the III class). We can say, therefore, that that period will suit our purpose which will admit of 61,000 III class trees attaining to the dimensions of 5 feet in girth. It takes—see page 19—53 years for the whole of the trees of the III class to do this, and therefore, in all probability not more than 33 years for 61,000 of such trees to achieve the same end.

7. Generally speaking, therefore—for the other miscellaneous species do not deserve consideration—a period of 35 years should reconcile itself to all the requirements of the stock, and during that time we should be justified in exploiting in the combined forests of the protected area and the Reserve—

(*a*) I class chír ...	8,485	trees.
(*b*) I class oak and rhododendrons ...	30,104	„
(*c*) II class ditto ditto ...	28,880	„
(*c*) I class miscellaneous ...	417	„
(*d*) II class ditto ...	1,100	„
(*e*) I and II class ayár ...	3,096	„
Total ...	63,597	„

giving a total volume of timber and fuel, according to the reducing factors employed by Mr. Fernandez, of—

(a) Timber	450,000 cubic feet.
(b) Fuel	4,000,000 maunds of 100 lb.

8. The estimated annual requirements of the settlement in respect of timber are—see page 218 of report—40,000 cubic feet in the round; and those of the right-holders 7,500 cubic feet, so that the available quantity of exploitable materials is only sufficient for a ten years' supply. And, in the case of fuel, the annual demand of the settlement amounts to 195,000 maunds, and that of right-holders to 130,000 maunds, so that the quantity of available firewood can only last 12 years.

9. Mr. Fernandez, in his summary of the Working-Plan, on page 218-219, arrives at a total exploitable stock, for the same tracts, of—

(a) Timber	872,000 cubic feet.
(b) Fuel	17,700,000 maunds.

10. This result is somewhat at variance with that given by him on page 192, *viz.* :—

Timber	895,466 cubic feet.
Fuel	17,500,000 maunds.

But both extend to a period of 60 years and are obtained, in so far as timber is concerned, by assuming that half of the II class chír trees can be removed, and 40 per cent. of the III class trees of the same species within that time. The much larger quantity of fuel is created in considerable part by a series of, I think, rather violent assumptions, based, as his conclusions here are, to a great extent, on observation of the uncounted species and classes. In this way alone he arrives at a total of 6,000,000 maunds. Most of these uncounted species are found growing along water-courses, whence it is not politic to remove them. The remaining excess of 7,700,000 maunds is brought about by making provision for thinnings of the whole stock of III and IV class trees, amounting to an average of 44 per cent. or more. It is, in my opinion, very doubtful if these operations can be made to reconcile themselves at all with the peculiar requirements of forests for which jardinage is acknowledged to be the only correct method of exploitation. Generally speaking, the ground, in any one locality, will have been sufficiently denuded by the extraction of the larger trees of each species, and I think it most unadvisable, under the circumstances, to give the local forest officer the power to denude these already too exposed slopes to almost any limit; and in practice the above provision really amounts to this freedom of action. If dead or dying trees are alone here indicated, then I have no objection; but there is nothing said to this effect in the report. Undoubtedly this factor must yield something important, but something also impossible to gauge for so long a period as 60 years.

11. Mr. Fernandez, adopting the above more excessive quantities, but a period almost twice as long as that proposed by me, arrives at the conclusion that his timber will supply a demand of 18 years and his fuel a demand of 50 years.

While I calculate that the demand for timber must hereafter remain unsupplied in these forests for 25 years, and that for fuel during 23 years, Mr. Fernandez's results give 42 years for timber and 10 years for fuel, during which none of the present demand can be met from either the protected area or the Reserve.

12. Mr. Fernandez accordingly looks about him for other sources of supply, and takes account of the following:—

(a) The Nilghát forests.
(b) Other sources.

The former he credits with being able to supply during the 60 years—

420,000 cubic feet of timber,
1,800,000 maunds of fuel,

the latter 1,447,520 cubic feet of timber.

These estimates do not appear to be based—if we except "other sources"—on more than an ocular survey of the tracts in question. By "other sources" it is inferred that Mr. Fernandez principally alludes to the Ránikhet forests, in respect of which I have observed, in my note on the Working-Plan for those forests, that there is really nothing to spare. Moreover, the distance from Naini Tál of that centre of supply is itself almost prohibitive. On the other hand, a very rich tract of chír forest is said to exist north of the Bhim Tál valley—forest "sufficiently rich to dispel any apprehension of a failure in the timber supply of the Naini Tál settlement." Mr. Fernandez has never seen these Bhim Tál forests, and Mr. Hearle, who has seen them, although testifying to their great richness, can "make no guess, however approximative, as regards their resources." This is not altogether satisfactory.

13. All that we do know *for certain* is that the area actually valued by Mr. Fernandez will, even according to his own calculations and on his own plan, cease to supply timber after 18 years, and will continue to supply no timber for the subsequent 42 years ; that is to say, if the demand upon this area is met in a continuous fashion and if sylvicultural and economical considerations admit of such continuous operations, which they will, of course, not.

According to my calculations, made on the same hypothesis, this same area would cease to supply timber after 10 years, and fuel after 12 years, but would continue to yield again after intervals of 25 and 23 years respectively.

14. The present Working-Plan is, as will be seen, no definite plan for a definite area of forest : it is more a series of proposals, based partly on a survey of the whole stock of forest, partly on an imperfect survey, partly on no survey at all. As such it is, I think, to be objected to. Its provisions appear to be arranged in a somewhat disconnected manner, making it anything but easy to grasp them in their entirety. Under the circumstances, it is well that an abstract of the plan has been prepared at the suggestion of the Conservator. Pages 1 and 2 of the report defined the area and situation of the proposed Working-Circle, but in the scheme itself the Nilghát and other forests are added to it.

15. A plan of operations for timber is given for the next 10 years ; but subject to the demand being met, and to the estimated yield of a whole block not being exceeded, the executive officer appears to be left entire freedom of action in regard to the number of trees to be felled in a compartment. A similar plan is given for the supply of firewood, which will be, however, as regards the trees to be specially felled for that purpose, restricted to well-defined areas each year. Here the quantity to be cut in each compartment is confined within a maximum, and this is satisfactory.

16. Neither the plan itself, nor the plan of operations for the next 10 years, make any mention of future improvements, although numerous plantations have in past years been made in these Naini Tál forests, and that artificial measures for re-stocking the blanks which interrupt the continuity of the forest in every direction would here appear to be a question of considerable importance.

This must be noted.

B. R.

E. P. D.—22-3-87.

APPENDIX VIII.

No. 585, dated Simla, the 1st August, 1887.

From—B. RIBBENTROP, ESQ., *Offg. Inspector-General of Forests to the Govt. of India,*

To—*The Secy. to Govt., N.-W. P. and Oudh, Revenue (Forests) Department.*

SIR,—In continuation of letter No. 408, dated the 16th ultimo, submitting, for His Honor the Lieutenant-Governor's orders, my opinion on the technical points of the Working-Plan for the Naini Tál forests of the Central Circle, I have the honor to state that, thanks to the courtesy of the Government of the North-Western Provinces and Oudh, I have been enabled to discuss the plan in question with Mr. Fernandez, and to suggest some slight additions which will, in my opinion, as explained below, render the plan unobjectionable.

2. My chief objection to the plan was based on Section I, Chapter IV, Part 3, of the Working-Plan, in which Mr. Fernandez states that the Divisional Officer may any day be flooded with requisitions for building timber that may swamp the entire yield, and thus throw out of gear the whole machinery of the Working-Plan. Under such conditions, it would naturally be impossible to frame a forecast of work. Mr. Fernandez now explains that he has taken the average requirements of the last five years as the basis of his proposals regarding the application of the Working-Plan, and that, unless very special circumstances arise, the requirements of the concessionists are not likely to exceed the amount of produce granted during the last five years. If this expectation can be confirmed on the authority of the Local Government, all objections under this head will fall to the ground; but it seems to me necessary that some such assurance should be given, since the actual yield of the forests, as ascertained, is but slightly in excess of the total requirements. It would have been advisable if the Working-Plan Officer had made sure of this point before submitting the plan for criticism; for as long as this was not done, no safe basis existed for the application of the Working-Plan in question.

3. The second technical point to which I drew attention was that the plan consisted of a series of mere proposals. The plan was built up so as to meet the present and probable requirements of a special and confined market, and resulted, therefore, in part at least, more in a scheme to meet this end than in a working-plan for a definite forest area. There can be no objection to this, but it would seem to me that the two questions—the real Working-Plan and the suggestion—should have been more clearly separated.

4. The plan is, as I understand now, really based on area, and the volume of material to be exploited is an estimate only, and is not to be regarded as the basis of the plan. This could not, however, be gathered from the way in which the plan was put before me, and it was, therefore, criticised as a plan based on volume of material. In this connection, I beg to place on record here the fact that, as regards working-plans for the more irregular Indian forests, for which jardinage is at present the only suitable method of treatment, we have now, after a period of doubt and experiments, come to the conclusion that we cannot do better than establish plans on the basis of area and sylvicutural requirements. Mr. Fernandez's plan under consideration shows the vacillation between the different methods which most of us to some degree shared. As a plan based on area and sylvicultural requirements, there can be no objection to it.

5. The estimate of produce expected annually from the cuttings to be made, according to sylvicultural requirements, over the whole area set apart for the year, is based on very complete enumerations and enquiries, and may, I think, be accepted as an estimate, though it might perhaps be objected to as the foundation of a working-plan. That estimate shows that the forests for which the Working-Plan has been prepared will certainly yield 895,000 cubic feet of timber and 17,500,000

cubic feet of fuel during 60 years. The demand during that period is calculated at some 2,000,000 cubic feet of timber and 2,000,000 cubic feet of fuel in excess of those figures, and the Ninglát forest is accordingly drawn within the sphere of exploitation during the next 10 years; but with regard to this area, the proposals must be regarded as suggestions only until it has been secured under the provisions of the Forest Act.

6. I have, after discussing the question closely, come to the conclusion that it will not be necessary to re-draft Chapter III, but beg to advise that the plan, as now more clearly explained in the accompanying table drawn up by Mr. Fernandez, may be sanctioned. In my opinion, it would be desirable to point out, in the letter, conveying sanction, that the entire area set apart for each year should be operated over by jardinage, and that the material estimated for should not be obtained from only a portion thereof. This is the meaning of the plan, which provides that the same area should be worked every 10 years.

No. 586.

COPY forwarded, for information, to the Conservator of Forests, Central Circle, North-Western Provinces and Oudh, in continuation of endorsement No. 409, dated the 16th ultimo.

B. RIBBENTROP,

Off'g. Inspector-General of Forests.

APPENDIX IX.

No. $\frac{174F.}{668-7}$ OF 1888.

RESOLUTION.

REVENUE (FORESTS) DEPARTMENT.

Dated Allahabad, the 28th March, 1888.

READ the undermentioned papers—

Working-Plan of the Naini Tál Working Circle.

Letter from the Officiating Inspector-General of Forests to the Government of India, No. 408, dated 16th June, 1887, and enclosures.

Letter from the Officiating Inspector-General of Forests to the Government of India, No. 585, dated 1st August, 1887.

RESOLUTION.—The Lieutenant-Governor and Chief Commissioner is pleased to sanction the Working-Plan for the Naini Tál forests in the Central Circle, with the provisoes ;—

(1) That the annual grant of standing timber to privileged villagers be restricted for the next five years to the average amount supplied to them during the last five years : the question being re-considered, if necessary, at the conclusion of that period.

(2) That the entire area set apart for each year be operated over by jardinage, and that the material estimated for be not obtained from only a portion thereof.

J. WOODBURN,

Chief Secy. to Govt., N.-W. P. and Oudh.

No. $\frac{175F.}{668-8}$.

COPY forwarded to the Inspector-General of Forests to the Government of India, for information.

No. $\frac{176F.}{668-9}$.

Copy also forwarded to the Conservator of Forests, Central Circle, for information and guidance, with the request that 100 copies of the plan be printed ; that Mr. Fernandez's supplementary statement of exploitations (copy enclosed) be added to the plan as an appendix ; and that 50 copies of the plan be forwarded to this office for distribution to the Government of India and other Local Governments and Administrations, the remaining copies being distributed by the Conservator of Forests, Central Circle, to other Conservators, as directed in Circular No. 3F. of 1886 from the Government of India in the Home (Forests) Department.

No. $\frac{177F.}{668-10}$.

Copy also forwarded to the Commissioner of Kumaun, for information with reference to correspondence ending with his letter No $\frac{1012}{XXIII-97}$, dated 3rd March, 1888.

By order, &c.,

W. H. L. IMPEY,

Under-Secy. to Govt., N.-W. P. and Oudh.

APPENDIX X.

Statement showing, in one General Scheme, the Exploitations prescribed for the next 10 years by the Working-Plan.

Year of Exploitation.	REGULAR TIMBER FELLINGS. (Part III, Chapter VI, Section II, pp. 194-95.) Locality. Block and compartment or Forest.	Acreage.	Material exploitable during next 60 years. Number of Trees of class I.	II.	III.	Estimate of total unconverted contents.	Maximum quantity to be taken out in any one year.	DEPARTMENTAL FELLINGS FOR FUEL. (Part III, Chapter VI, Section III.) Locality. Block and compartment.	Acreage.	Estimate of total material exploitable during next 60 years.[6]	FELLINGS FOR HARD-WOOD CHARCOAL. (Part III, Chapter VI, Section VI.) Locality. Block.	Acreage.	Estimate of total material exploitable during next 60 years.	Maximum quantity that may be taken out in any one year	Remarks.
						C. ft.				Mds.			Mds.		
1886-87	Bhawáli, 1, 14, 13, 4, 7, 9, 11, 12.	1,626	560	650	1,000	115,000[1]	40,000 unconverted cubic feet.	Chína, 3, 7 ...	739	604,000[7]	Bunsi ...	2,000	900,000[8]	80,000 maunds.	[1]A portion of this will probably remain over and have to be utilized in 1888-89.
1887-88								Chína, 12, 14 ...	618	659,000	Loichusáni ...	2,600	1,040,000[8]		[2]A portion of this will probably remain over and have to be utilized in 1890-91.
1888-89	Budhlákot, 1 and 2.	551	450	400	300	75,000[2]		Chína, 13 ...	362	646,000	Budhlákot ... Chína ...	2,600	1,930,000		[3]About 200,000 cubic feet will remain unutilized at the expiration of the ten years for which this Working-Plan has been drawn up.
1889-90								Jákh, 9 ...							[4]Comprises scattered trees, some of which will be sold to petty purchasers of standing trees during the period of 10 years. (See page 194, paragraph 7.)
1890-91	Ninglát ...	About 8,000	?	?	?	420,000[3]		Jákh, 1—7 ...	1,071	811,000	Budlákot, Jákh ...	2,500			[5]No portion of this will be touched during the 10 years, except to supply timber to villagers enjoying concessions, whether granted under settlement or by executive order of Government. (See page 195, paragraph 1.)
1891-92								Nalena, 8—15, 19—24; Kuria 3—5, and 7—9.	2,772	1,380,000[7]	Bhawáli ...	2,000	333,000		[6]Of this material, only so much will be taken out as will be required to complete the Commissariat indent, after the refuse from the timber fellings (within remunerative distance) and windfalls occurring on a large scale in contiguous areas have been utilized. (See page 195, Section III.)
1892-93								Bhawáli, 12—16 ...	896	729,000	Nalena, Kuria ...	3,000	432,000		[7]Some of this, in the Chína and Nalena blocks, up to 1,000 maunds annually in each block, may be cut *every year* for burning lime. (See page 199, Section VII.)
1893-94								Laria Kánta, 8—11,	689	913,000	Mangoli ...	3,200	1,280,000		[8]Up to 1,500 maunds in each of these blocks may be cut *every year* for burning lime. (See page 199, Section VII.)
1894-95								Bhawáli, 17—19, 28,	549	720,000	Saim Dhár ...	1,900	860,000		*N.B.*—The only other special felling of green standing wood not provided for in the preceding columns will take place in the close, badly grown, young patches of broad-leaved species, which will be cut back for an improved regrowth. (See page 198, Section IV.)
1895-96								Bhawáli, 20, 23—27, 29.	807	628,000	Adhora ...	2,400	1,060,000[8]		The requirements of concession-holders, as estimated on page 33, will be met from the refuse of the fellings heading the three main preceding columns, and from windfalls and special grant of a few scattered trees in areas outside those fellings.
								Laria Kánta, 1—7; Kuria, 6.	1,362	1,062,000	Kharil, Dhabka ...	3,400	1,360,000		Also see Sections IV and V of Part III, Chapter VI.
	Total ...	...	...	...	...	610,000			9,865	8,152,000		24,900	9,195,000		
	Balance in original Protected Forest.	...	...	...	...	323,000[4]			...	...		...	353,000		
	Balance in proposed Reserve.	...	...	...	...	371,000[5]			...	...		...	...		
	GRAND TOTAL,	...	...	...	...	1,304,000			9,865	8,152,000		24,900	9,548,000		